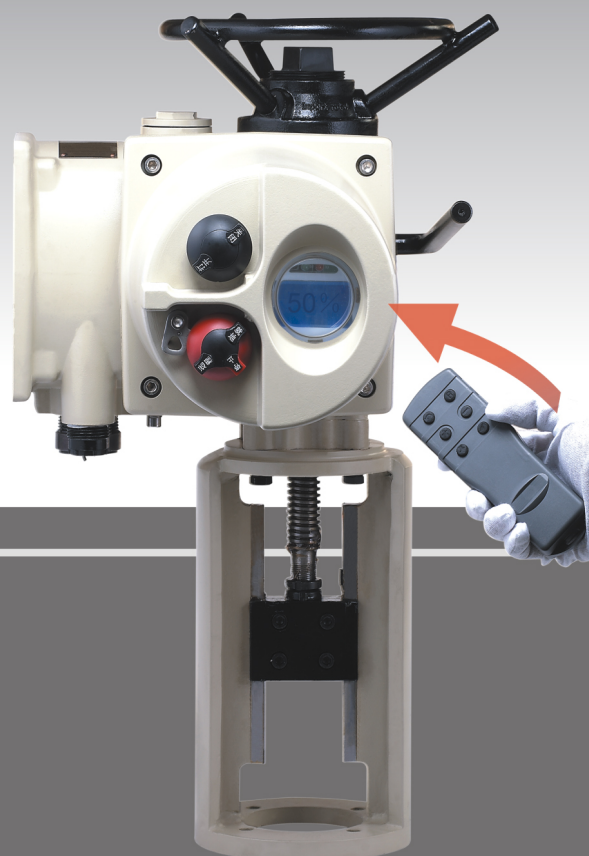
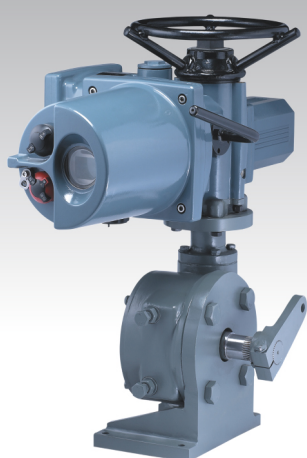
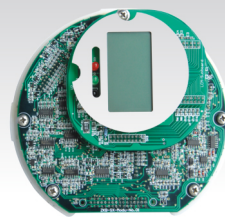
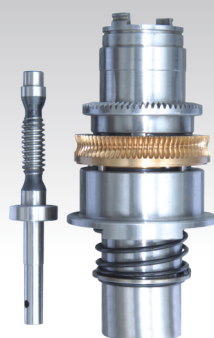


HURKO



HURKO Intelligence electric actuator



Abouts us:

On the road of the progress, we keep to the guidelines of "Prospering with quality, rooting with science and technology" all along, also we can grasp a new direction in market development accurately, innovate continuously and exploit bravely! We continuously hanker for the better knight service and satisfy the consumers' needs farthest!

With an emphasis on supreme technology, the WenZhou HuaKong Science and Technology CO.,LTD is a manufacturer of the intelligent electric actuator that focuses on research & development, production, sales and customer service. We have abundant technology strength, advanced manufacture technics, and perfect machining and test equipment. Our intelligent actuators are provided with excellent quality, high capability & low price and simple manipulation. In the all-over world actuator domain our product is in the one-up status. It is introduced into from the foreign techniques. By our abstraction and amelioration our electric actuator is excogitated. It is a supernal, pithy and top end intelligent product nowadays. It adopts the super large-scale integration, so it has powerful functions and steady performance. Our actuator has the LCD of the Chinese or English menu. It is the mechanical and electric integrative product assembled with intelligent, efficient and human performance.

Our company has the advanced machining equipments and a lot of professional persons with ability in automatization, instrumentation, machine design, motor design and so on. These offer powerful sustainment and guarantee for the quality and performance of the "Hurko®" electrical actuator. Our electric actuator is widely used in the domain of the power station, petroleum, paper-making, chemical plant, refinery, water disposal and so on. Many consumers have already approbated and loved our electric actuator.

Our company has research and development department, technology department, sales department, examination department, production department, personnel department, logistics department and so on. Every department has executed the quality system certificate of ISO9001:2000. In our company, every working-procedure is held the pass strictly. On the road of the progress, we all along make great efforts!

The excellence of our intelligent electric actuators owing to our high-precision numerical-control equipments, high-exactitude detection instruments, high-tech, strict quality management system, professional persons, and high-level science and technology strength! On the road of the progress, we are all along with all our hearts!

If you want to know more about us, please access our web-site [Http://www.hurko.cn](http://www.hurko.cn) .

HK/HKE/HKM/HKC/HKJ/HKJM Range

Intelligent Electric Actuator Selection
Installation and Debugging Instructions

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Chapter one HKM range intelligent electrical actuator selection installation and debugging instructions

1: Summarizing

HKM actuator is the world leader in the field of electrical actuator products for the petroleum, gas, power, water, waste treatment and so on industries. The series HKM actuator have two kinds of menu, one is the Chinese menu, the other one is the English menu. Here we only explain the Chinese menu actuator, if you want to know the English menu actuator, you can access our web-site: www.hurko.cn.

To Hurko HKM actuator, we enjoy an unparalleled reputation for our imaginative and effective use of advance technologies, and the quality and proven reliability of our products.

HKM actuator has the expertise to take on virtually any actuator challenge—including equipment for use in hazardous extreme cold and sub-sea conditions.

Customers choose HKM actuator for our ongoing commitment to:

Technological innovation: at Hurko we pride ourselves on developing leading-edge actuation solution through on-going research and development.

Flexibility: every HKM actuator is precision-built using pre-manufactured modules of the finest materials to meet a vast range of specification quickly and efficiently.

Quality: every HKM actuators are hanging assembled and fully rig tested to stringent standards prior to dispatch.

Reliability: every HKM actuators use advanced lubrication, electrical, and sealing techniques, to be virtually maintenance free.

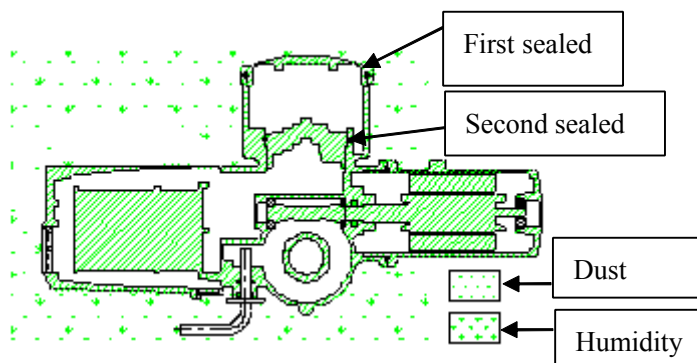


Diagram 3-1

2: Main Technique Parameters

■ Input signals:

4mA~20mA; 1VDC~5VDC;

2mA~10mA; 0.5VDC~2.5VDC;

20V~60VDC or 30V~220 VAC electricity signal;

■ Power supply:

380VAC/50Hz; 220VAC/50Hz

■ Accuracy: $\leq 1\%$

■ Deadband: 0.1~9.9% of travel between open and close limit positions

■ Enclosure: IP68

■ Anti explosion mark: Exd II CT4

- Ambient temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Ambient humidity: $\leq 95\%$

3: Features Specification

3.1 The working principle of actuator

Motor spin to pass unite axle organization directly drive worm turn , worm drives worm gear to turn , and then drives output shaft through clutch to turn. When switch handle turns , in the location of by hand , on clutch, move , take off open worm gear and handwheel coupling, turn handwheel drive output shaft turn. Electric operation is prior always, unless operating handle has been locked , in the files of by hand. When output shaft turns , drives a pair of bevel gear to turn , and changes through valve position sensor detection valve position.

3.2 The function characteristic of actuator

3.2.1 Double sealed

All HKM actuator are double sealed watertight enclosure to IP68 (3 meters—48hours) and provide complete protection on the internal equipment even if the cable gland are opened. Refer to Diagram 3-1.

3.2.2 Non-intrusive design

Non-intrusive switching:

The HKM electric actuator employs magnetic induction mode switching

Non-intrusive setting:

Can be instantly set, checked and actuator non-intrusively using the hand held infra-red setting tool.

Refer to Diagram 3-2 and Diagram 3-3.

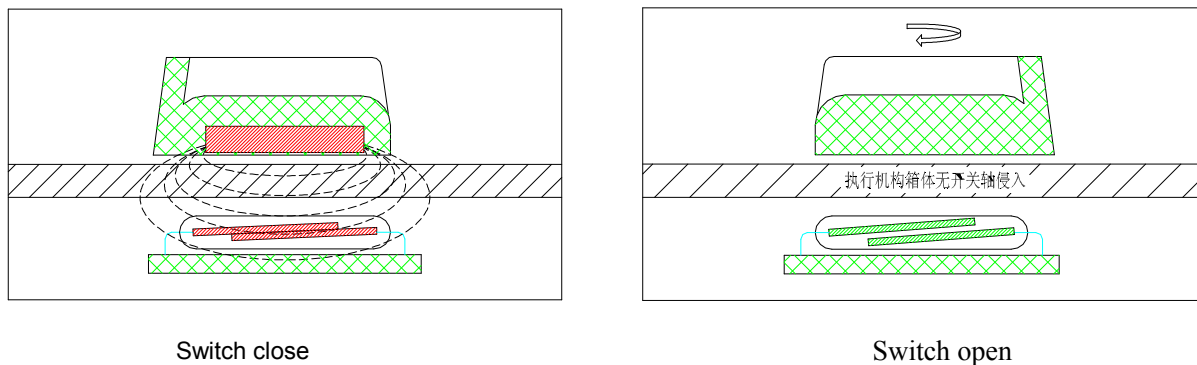


Diagram 3 Non-intrusive designs

3.2.3 Protection features

3.2.3.1 Torque protection

The torque protection values are independently configurable in the range $40 \sim 120\%$ of rated torque ,serve as over-torque protection for the entire valve travel.

3.2.3.2 Limit protection

When the actuator runs to close limit position or opening limit position, it will stop(if limit position protect setting is “有”).

3.2.3.3 Automatically phase order adjustment

HKM actuator automaticly detect the phase order of the three-phase power supply , encourages the switch of which one through proper logic operation when deciding actuator's operation in order to guarantee the correct phase order of the motor. If no this function the motor maybe damage the valve because of the phase order mistake of wiring. With this function the actuator need not consider the phase order.

3.2.3.4 It is instant to turn on the contrary to protect

When actuator accepts to the order of opposite direction movement, adds a time voluntarily to postpone , prevents producing the unnecessary abrasion for valve shaft and gearbox..

3.2.3.5 Power supply losing-phase protection

HKM actuator has the losing-phase protection function. It adopts to watch on the voltage and the electric current, can detect the power supply loses phase or not, also can detect that if the power supply loses phase or not when the motor is in the operation course, so, can prohibit the motor start the operation, avoid to execute the running instruction to the motor when losing phase .

3.2.3.6 Protection when valve is locked

Regardless of actuator to open direction or close direction movement still, sending the signal that encourages motor after seconds time from 5s to 10s , temporarily, prohibit torque to be protected (if the actuator in the above-mentioned second time of 5-10 have no movement, control circuit can cut off the power supply of motor).

3.2.3.7 Motor over temperature protection

Two thermostats are embedded in the motor stator end windings that will trip and de-energise the motor if the temperature exceeds its rating. The thermostats can be overridden during an ESD operation.

3.2.4 Checking for valve position and torque

The actuator has a pair of bevel gear to pick up the turn of the output shaft , drives a circular magnetic flat on the circumference has many N poles and S poles, makes its two environmental magnetic quick switches produce pulse signal, let the pulse signal be sentenced and counted so as to calculate the valve position. Valve position detection resolution capacity is 11.5° output shaft corner, output shaft revolution amount to value upper limit reaches 2040 turns , this stroke scope signifies HKM actuator is great.

The detection of torque comes to get from the detection of the electric current and magnetic flux, this has realized the continuous measure for output torque, makes adjustment of the torque protection value can be accomplished with the setting-tool easily.

3.2.5 Solid state relay and function of inertia braking

With solid state relay, substitute AC contactor has raised the working frequency of regulation type , and has prolonged service life.

To satisfy the requirement of higher positional accuracy, HKM actuator has offered inertia braking function. If client needs when ordering goods the function of inertia braking, we offer the product that has this function. Whether use this function can pass by user to setting tool, select in scene. The function of inertia braking takes effect under various electric mode of operations.

What needs pay attention is that have used the function of inertia braking and have increased motor winding give out heat to measure. Therefore we suggest the condition in necessity to use the function of inertia braking.

3.2.6 Intermittent timing operation

Intermittent timing operation means that actuator will execute a period of time opening and execute a period of time closing and a period of time opening again, and so on. The motion time and stopping time may be setting by the infra-red setting. This effectively increases the valve stroke time and can be adjusted to prevent hydraulic shock (water hammer) and flow surge in pipelines.

3.2.7 Network communication

HKM actuator provided full compatibility with proprietary remote supervisory control system as well as all current network communication protocols, including Modbus, Profibus and Foundation Fieldbus.

3.2.8 Actuator's setting and check

All HKM actuator functions can be rapidly set and checked without removing the actuator covers (even in wet or hazardous conditions) using the free, infra-red setting tool supplied. Intrinsically safe-certified and watertight, this handy device can also be used to control the actuator locally. Actuator setting such as the following functions with infra-red setting tool.

- the rotary orientation of output shaft during the close stroke
- protection function of open limit position and close limit position
- protection values for torque during the open or close stroke
- setting open or close limit position
- push to run or maintain for local control
- setting ESD Optional function
- setting analogue control signal
- setting interlocks function
- setting the four state indication relay

3.2.9 Display of the actuator

A back-lit liquid crystal display gives digital indication from fully open to fully close in 1% increments. Two LED's colored red, green for indication of close and open. The liquid crystal could display menu, alarm and valve position in the same panel. And the alarm includes valve alarm, actuator alarm, control system alarm and actuator battery status. The back-lit will lighting as long as main power was supplied. The local display can be rotated to suit actuator orientation. Refer to Diagram 3-5.

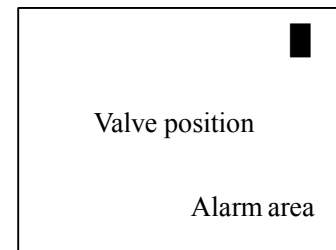


Diagram 3-5

3.2.10 Operation of the actuator

The mode of operation of actuator divides into the electric operation and hand operation. Actuator has handwheel used in operating by hand. Hand / electric switch handle is used to get actuator switch to hand operation, when the motor of actuator operates, switches organization because of having designed electric prior operation, actuator can return to electric mode of operation voluntarily.

HKM actuator standard handwheel is top pack handwheel, at the same time, we can offer the side that can be chosen to pack handwheel, lean to pack handwheel turn by deceleration gear biography go to output shaft, make by hand operating and more economical.

3.2.11 Structure of the actuator (see diagram 3-7)

a. Even if opening terminal cover in scene, the alone sealed terminal case can also guarantee the integrity of the electric equipment.

b. The control switch and working way of field work encourage way with the magnetism of isolation, have avoided needing sealed link up axle.

c. Show window on the spot can alternate different position, in order to meet the installation position of actuator. Additionally pass seal up show window, the infrared ware of the use for special purpose is set and diagnosed for actuator, need not open electrical case in scene and expose built-in control circuit, this can prevent the control circuit from dust and moisture's corrode.

d. Low inertia high torque motor. After starting, motor can reach the torque of peak value promptly, if the motor has no excitation, it will not nearly exceed restricted transport move, in motor coil, there are some accurate temperature switches, these can avoid efficiently that motor is in overheat state.

e. The torque detection circuit of special design has avoided to use lever and the spring switch of torque control.

f. Worm drives worm gear in oil bath, this can raise the actuator's life farthest in the different environments.

g. Valve position counter can measure and control the stroke of actuator accurately, even if the power supply shuts off and electrifies the power supply again, the actuator can also guarantee the enumerated accuracy of valve position.

h. Directly drive handwheel but in power source appearance fault, offer reliable urgent hand operation.

i. The hand/ electric clutch can also be operated safely even if the motor is running.

Notice: When motor turns , clutch will automatically switch to electric mode, unless handle is locked in the location of hand intentionally.

j. To raise life and be easy to dismantle , the thrust of design that can be lubricated , can unload actuator under not change the condition of valve position.

k. To be convenient for suiting with valve , detachable drive bushing can be compound processing with valve rod.

l. To change the output speed of actuator easily, motor axle and worm axle are mutually independent.

m. Support the bus line on-the-spot of open : Modbus, CAN, Profibus and FF etc.

3.2.12 The organization of explosion proof of actuator designs

The structural design of explosion proof of actuator is basis: GB3836.1-2000 《Electrical equipment for explosive gas atmosphere use the first part general requirement 》 and GB3836.1-2000 《Electrical equipment for explosive gas atmosphere use the second part separating explode type》 in which the relevant stipulation and requirement are used to design the separating explode products, separating explode sign is ExdIIBT4. It applies to 1,2 environments of work area that contain II A, II B level and the T1-T4 level explosive mixture, atmosphere force 86 Kpa-106 Kpa, environmental temperature - 30 °C + 70 °C.

3.2.12.1 Good sealing

The combination surface of main housing and coordinate element is long , has little gap, this is advantageous to the separating explode, at the same time, with the fine O model sealing circle and the skeleton revolving oil sealing of import, it is satisfied with the sealing requirement.

3.2.12.2 Equipment for inducting the cable into actuator

Equipment for inducting the cable is designed according to GB 3836.2 and appendix D 《the supplementary requirement that equipment for inducting the cable of separating explode type and gasket 》, it is the separating explode structure, detail is shown in Fig.3 - 8. Thread combines length and sealing ring with the combination width of cable is suitable to the requirement of separating explode standard.

3.2.12.3 The inducting link of the explosive proof type actuator

Wire lead into structure have adopted outside thread coordination, the method and organization that fills with fluid sealant have ensured the equipment of the separating explode performance, details are shown in Fig.3-9.

3.2.12.4 The window structure of the explosion proof type actuator

Transparent window and housing have joined with O model weather strip and fluid sealant fill (this place must not open , otherwise can destroy to separating explode surface), double-deck transparent material presses to surround the structural installation that compressed tightly , have satisfied the requirement of 5.4, 5.5 and 8.1 in GB 3836.2, detail is shown in Fig.3 - 10.

To guarantee that the installation of actuator in difference has normal liquid crystal on direction to show direction, character shows normally that the liquid crystal of direction and actuator shows that screen has offered 4 kinds installation:

- Actuator horizontal direction installation (handwheel upturns), liquid crystal shows that screen is installed according to normal location;
- Under actuator dynasty lean direction installation (handwheel adown), liquid crystal shows that screen is installed according to normal location, can use setting tool to make the show way as show on the contrary;
- The actuator direction of left side installation (handwheel leftward), liquid crystal shows that screen is installed near flange a side;
- The actuator direction of right side installation (handwheel rightward), liquid crystal shows that screen is installed near flange a side, can use setting tool to make the show way as show on the contrary;

The installation direction that offers actuator more by user, we show the correctly installation supply of screen according to liquid crystal. If user does not offer the installation of actuator direction easily, we can send the

staff to the spot to set the direction of the liquid crystal screen.

3.2.13 Electronic latch function

Actuator has arisen the phenomenon of over torque very easily when starting high inertia load. To be able to start high inertia load successfully, HKM actuator prohibits torque temporarily in sending some seconds of times after signal that encourage motor to protect function. This is electronic latch function. If have sent the signal that encourages motor for some seconds actuator can not move, control circuit can break the power source of motor. Electronic latch function for open the valve that is in closed position for a long time very effective.

3.2.14 Protect data function when main power source falls

When main power source loses electricity, from battery, supplies power to valve position detection circuit, and preserve valve position in EEPROM. Battery still supplies power to LCD (but do not sustain to be shaded) and supplies power to 4 state instruction relaies, the service life of battery can reach 2 years. Suggest to change battery when main power source has electricity.

3.2.15 Application range

HKM actuators are suitable for proportional control in automatic control loops that the system rate of change is relatively high, and high accuracy continuous modulation is necessary. When modulating applications require increased rates of starts per hour, the HKM actuator ranges can be operated up to a rate of 1200 starts per hour providing the average torque required by the valve in mid stroke does not exceed 50% of the rated torque of the selected actuator.

HKM actuator with W gear units could drive quarter turn modulating valve. And this combination output rated torque from 470 to 51500 N•M. For more detail information about gearbox please send message to our company.

4: Actuator Data

The Table 4-1, Table 4-2, Table 4-3, Table4-4 and Table4-5 is also suitable for the HKE series actuator.

Table 4 –1 Parameters of the multi-turn actuator (380VAC/50Hz)

Actuator rpm		18	24	36	48	72	96	144	192
HKM03 HKE03	Modulation torque N.m	17	17	15.6	13.6				
	Max torque N.m	44	44	39	35				
	Motor power kW	0.07	0.07	0.13	0.14				
	Rated current A A	0.75	0.75	1	1.1				
	Modulation thrust KN	7.14	7.14	6.55	5.71				
	Max thrust KN	14.2	14.2	12.6	8.4				
	Liner speed mm/s	1.5	2	3	4				
HKM05 HKE05	Modulation torque N.m	34	34	30	27				
	Max torque N.m	80	70	70	63				
	Motor power kW	0.12	0.13	0.19	0.23				
	Rated current A A	0.85	1	0.5	2.1				
	Modulation thrust KN	14.2	14.2	12.6	8.4				
	Max thrust KN	25.6	22.6	22.6	20.1				
HKM10 HKE10	Liner speed mm/s	1.5	2	3	4				
	Modulation torque N.m	81	81	68	54	47			
	Max torque N.m	159	142	106	89	71			
	Motor power kW	0.3	0.3	0.35	0.35	0.47			
	Rated current A A	2.3	2.3	2.8	2.8	3.6			
HKM20 HKE20	Liner speed mm/s	1.8	2.4	3.6	4.8	7.2			
	Modulation torque N.m	152	152	129	102	102			
	Max torque N.m	266	266	212	177	177			
	Motor power kW	0.47	0.47	0.58	0.68	0.7			
	Rated current A A	3.6	3.6	4.6	5.5	5.5			
	Modulation thrust KN	25	25	21	16.7	14.5			
	Max thrust KN	33.7	33.7	25	21	16.7			
	Liner speed mm/s	1.8	2.4	3.6	4.8	7.2			

HKM55 HKE55	Modulation torque N.m	27	271	253	203	203			
	Max torque N.m	708	708	531	407	284			
	Motor power kW	0.9	1.05	1.27	1.2	1.35			
	Rated current A Δ	6	7	9	7.8	8.2			
	Modulation thrust KN	27	271	253	203	203			
	Max thrust KN	708	708	531	407	284			
	Liner speed mm/s	2.4	3.2	4.8	6.4	9.6			

Table 4 - 2 Parameters of the multi-turn actuator (220VAC/50Hz)

	Actuator rpm	18	24	36	48	72	96	144	192
HKM03 HKE03	Modulation torque N.m	12	12	10	10				
	Max torque N.m	24	24	21	20				
	Motor power kW	0.06	0.08	0.08	0.1				
	Rated current A Δ	1.6	1.8	1.8	1.9				
	Modulation thrust KN	5	5	4.4	4.1				
	Max thrust KN	7.1	7.1	6.6	5.7				
	Liner speed mm/s	1.5	2	3	4				
HKM05 HKE05	Modulation torque N.m	20	18	15	13				
	Max torque N.m	42	38	33	27				
	Motor power kW	0.12	0.12	0.12	0.12				
	Rated current A Δ	2	2	2	2				
	Modulation thrust KN	8.4	7.6	6.3	5.5				
	Max thrust KN	12.6	11.3	9.7	8				
	Liner speed mm/s	1.5	2	3	4				
HKM10 HKE10	Modulation torque N.m	40	32	26	25	18			
	Max torque N.m	85	77	58	55	38			
	Motor power kW	0.19	0.21	0.23	0.25	0.28			
	Rated current A Δ	2.3	2.45	2.8	3.2	3.4			
	Modulation thrust KN	12.4	9.9	8.1	7.8	5.6			
	Max thrust KN	18.9	17.1	12.7	12.1	8.4			
	Liner speed mm/s	1.8	2.4	3.6	4.8	7.2			

Table 4 - 2 Parameters of the multi-turn actuator (220VAC/50Hz) (continue)

	Actuator rpm	18	24	36	48	72	96	144	192
HKM20 HKE20	Modulation torque N.m	70	70	55	42	42			
	Max torque N.m	133	133	107	89	89			
	Motor power kW	0.28	0.35	0.32	0.35	0.37			
	Rated current A Δ	3.4	3.75	3.6	3.75	3.9			
	Modulation thrust KN	21.7	21.7	17.1	13	13			
	Max thrust KN	31.6	31.6	25.4	21.1	21.1			
	Liner speed mm/s	1.8	2.4	3.6	4.8	7.2			
HKM55 HKE55	Modulation torque N.m	180	150	130	102	72			
	Max torque N.m	343	328	265	204	142			
	Motor power kW	0.8	0.8	0.75	0.8	0.8			
	Rated current A Δ	2.4	3.2	4.8	6.4	9.6			
	Modulation thrust KN	57.6	48	41.6	32.6	23			
	Max thrust KN	87	81	65	50.2	34.9			
	Liner speed mm/s	57.6	48	41.6	32.6	23			

Table 4-3 dimension table of the interface

Actuator type	HKM03/HKM05	HKM10/HKM20	HKM55
	Type A		
Rated thrust KN	44	100	150
	Max bore		
Outside bore mm	32	51	67
Inside bore mm	26	38	57

Type B			
B1 mm	42	60	80
B3 mm	20	30	40
B4 mm	20	30	44
Hand-wheel gearbox ratio			
Standard	Directly	Directly	Directly
Extra option	—	—	—
Flange size	F10	F14	F16
Net weight	33	55	80

Table 4-4 Parameters of the linear-travel actuator(380VAC/50Hz)

Type	Output rev rpm	18	24	36	48	72
HKML03 HKEL03	The diameter of drive screw rod	26/3				-
	Max.liner stroke mm	115				-
	Flange type(ISO 5210)	F10				-
	Regulate thrust KN	9.20	9.20	8.45	7.37	
	Liner speed mm/sec	0.9	1.2	1.8	2.4	
	Rated close thrust KN	18.43	18.43	16.26	14.63	
HKML05 HKEL05	The diameter of drive screw rod	26/3				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F10				
	Regulate thrust KN	18.43	18.43	16.26	14.63	
	Liner speed mm/sec	0.9	1.2	1.8	2.4	
	Rated close thrust KN	33.06	29.27	29.27	26.02	
HKML10 HKEL10	The diameter of drive screw rod	32/6				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	31.15	31.15	26.12	20.74	18.06
	Liner speed mm/sec	1.8	2.4	3.6	4.8	7.2
	Rated close thrust KN	46.87	41.87	31.15	26.12	20.74
HKML10 HKEL10	The diameter of drive screw rod	38/14				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	18.91	18.91	15.88	12.61	10.97
	Liner speed mm/sec	4.2	5.6	8.4	11.2	16.8
	Rated close thrust KN	28.49	25.45	18.91	15.88	12.61
HKML20 HKEL20	The diameter of drive screw rod	32/6				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	58.39	58.39	49.56	39.18	39.18
	Liner speed mm/sec	1.8	2.4	3.6	4.8	7.2
	Rated close thrust KN	78.37	78.37	62.62	52.25	52.25
HKML20 HKEL20	The diameter of drive screw rod	38/14				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	35.49	35.49	30.12	23.82	23.82
	Liner speed mm/sec	4.2	5.6	8.4	11.2	16.8
	Rated close thrust KN	47.64	47.64	38.06	31.76	31.76

Table4-5 Parameters of the liner-travel actuator(220VAC/50Hz)

Type	Output rev rpm	18	24	36	48	72
HKML03	The diameter of drive screw rod	26/3				

HKEL03	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F10				
	Regulate thrust KN	6.50	6.50	5.42	5.42	
	Liner speed mm/sec	0.9	1.2	1.8	2.4	
	Rated close thrust KN	13.00	13.00	11.38	10.84	
HKML05 HKEL05	The diameter of drive screw rod	26/3				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F10				
	Regulate thrust KN	10.84	9.76	8.13	7.05	
	Liner speed mm/sec	0.9	1.2	1.8	2.4	
	Rated close thrust KN	22.76	20.60	17.89	14.63	
HKML10 HKEL10	The diameter of drive screw rod	32/6				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	15.37	12.29	9.99	9.60	6.91
	Liner speed mm/sec	1.8	2.4	3.6	4.8	7.2
	Rated close thrust KN	32.65	29.58	22.28	21.19	14.60
HKML10 HKEL10	The diameter of drive screw rod	38/14				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	9.34	7.47	6.07	5.84	4.20
	Liner speed mm/sec	4.2	5.6	8.4	11.2	16.8
	Rated close thrust KN	19.85	17.98	13.54	12.84	8.87
HKML20 HKEL20	The diameter of drive screw rod	32/6				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	26.89	26.89	21.13	16.13	16.13
	Liner speed mm/sec	1.8	2.4	3.6	4.8	7.2
	Rated close thrust KN	51.09	51.09	41.10	34.19	34.19
HKML20 HKEL20	The diameter of drive screw rod	38/14				
	Max.liner stroke mm	115				
	Flange type(ISO 5210)	F14				
	Regulate thrust KN	16.35	16.35	12.84	9.81	9.81
	Liner speed mm/sec	4.2	5.6	8.4	11.2	16.8
	Rated close thrust KN	31.06	31.06	24.99	20.78	20.78

5: Actuator Performance

5.1 Torque and turning range

■ position setting range: 3.5 to 2040 turns, with a minimum angular resolution to 11.5° of actuator output center column.

■ torque switch setting: 40% to 120% rated torque.

5.2 Cable entry and connecting terminals

The sizes of three cable entries are double M25 and M40. make cable entries appropriate to the cable type and size. The sizes of four power terminals are M5. The sizes of control terminals are M4. Check that supply voltage is the same as that, marked on the actuator nameplate begin by connecting these cables.

5.3 Interface for machine installation

The actuator contains thrust type and non-thrust type. The thrust type is: A type, the non-thrust type is made of B1, B3, B4. The drive bush's shape for every link types please refer to diagram 5-1 and diagram 5-2.

5.3.1 Type A drive bush

The type A thrust bush suit the position of the valve-mounting flange.

5.3.2 Type B drive bush

Driving shaft bored and keyed to ISO 5210 standard. And the type B non-thrust bush has three basic form as follows B1, B3 and B4.

5.3.3 Type B1

The B1 is supplied a big key and shaft to drive the valve.

5.3.4 Type B3

The B3 is supplied a small key and shaft to drive the valve.

5.3.5 Type B4

B4 is supplied blank and must be machined to suit the input shaft of the gearbox or valve that it will drive.

a. Thrust type:

Diagram 5-1: Links of basic-base drive-bush for HKM03~HKM55 actuator

b. Non-thrust type:

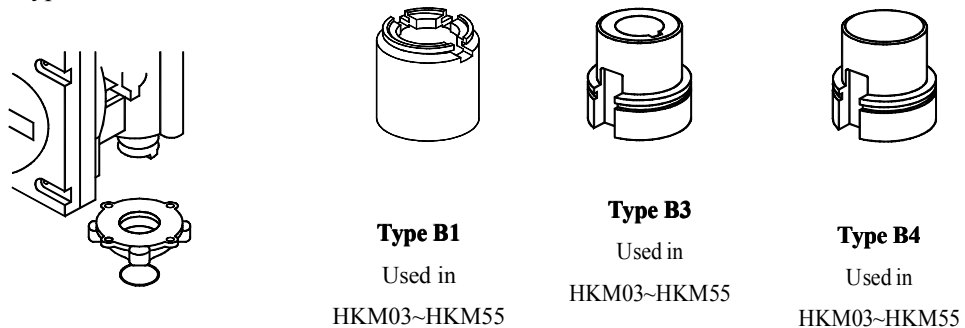


Diagram 5-2: Links of non-thrust type drive-bush for type HKM03~HKM55

5.4 Additional gear-box

You can use the gear-box to make the HKM linear stroke actuator as the angular stroke actuator, please see table 5-2.

5.5 Oscillation

The normal oscillation frequency and intensity for rang HKM is during the 10Hz ~ 200Hz and 0.5 times acceleration of gravity.

5.6 Shielding and flameproof

Waterproof type: accord with <<GB4208-84>> IP68 proof grade

Flameproof type: accord with <<GB3836.1.2-2000>> d II BT4 proof grade

Table 5-2 HKM actuator/W gearbox combination data

Combination	Rated Torque (N.m)	Stroke Time (s)	Actuator RPM (rpm)	Gearbox Ratio	Max Bore (mm)	Combination	Rated Torque (N.m)	Stroke Time (s)	Actuator RPM (rpm)	Gearbox Ratio	Max Bore (mm)
HKM03B4/ W4	410	29	36	70:1	64	HKM10B4/ W6	1770	29	36	70:1	102
HKM03B4/ W4	280	25	24	40:1	64	HKM10B4/ W6	2052	44	24	70:1	102
HKM03B4/ W4	267	33	18	40:1	64	HKM20B4/ W6	2734	22	48	70:1	102
HKM03B4/ W4	418	44	24	70:1	64	HKM10B4/ W6R	2537	29	72	140:1	102
HKM05B4/ W4	558	25	24	40:1	64	HKM10B4/ W6R	2750	44	48	140:1	102

HKM05B4/ W4	723	22	48	70:1	64	HKM10B4/ W7	2016	38	24	60:1	127
HKM05B4/ W4	535	33	18	40:1	64	HKM20B4/ W7	3328	25	36	60:1	127
HKM05B4/ W4	789	29	36	70:1	64	HKM20B4/ W7	3784	38	24	60:1	127
HKM03B4/ W4R	447	25	48	80:1	64	HKM10B4/ W7R	2690	38	48	120: 1	127
HKM03B4/ W4R	503	33	36	80:1	64	HKM10B4/ W7R	3640	38	72	180: 1	127
HKM05B4/ W5	438	25	24	40:1	76	HKM20B4/ W8	3800	38	24	60:1	153
HKM05B4/ W5	842	22	48	70:1	76	HKM55B4/ W8	6370	25	36	60:1	153
HKM05B4/ W5	417	33	18	40:1	76	HKM55B4/ W8	6830	38	24	60:1	153
HKM05B4/ W5	915	29	36	70:1	76	HKM20B4/ W8R	4880	38	48	120: 1	153
HKM05B4/ W5	1014	44	24	70:1	76	HKM20B4/ W8R	7325	38	72	180: 1	153
HKM03B4/ W5R	525	38	48	120:1	76	HKM20B4/ W8R	6072	38	36	60:1	153
HKM05B4/ W5R	695	25	48	80	76	HKM55B4/ W9	6211	25	24	60:1	178
HKM05B4/ W5R	760	33	36	80	76	HKM55B4/ W9	15412	38	72	180: 1	178
HKM05B4/ W5R	1618	44	48	140	76	HKM55B4/ W9R	17004	38	24	60:1	203. 2
HKM05B4/ W6R	1618	44	48	140	102	HKM55B4/ W10	17148	38	72	180: 1	203. 2

5.7 Coupling interface

5.7.1 Coupling interface for HKM/HKML

HKM HKML interface table

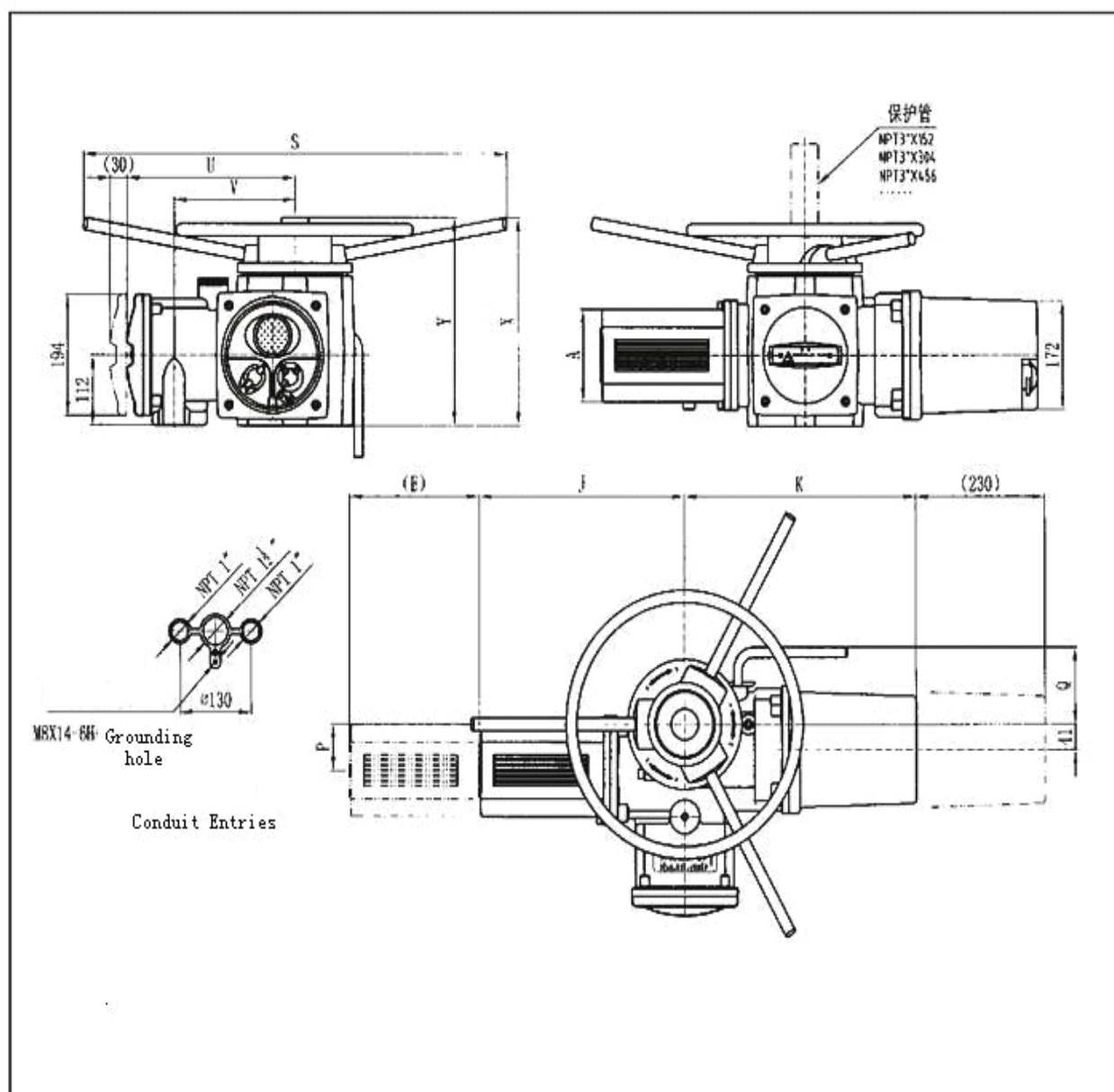
Actuator type	HKM(L)03/HKM(L)05	HKM(L)10/HKM(L)20	HKM55
A thrust coupling			
Rated thrust KN	44	100	150
Type A max. valve-shaft diameter			
Basset shaft mm	32	51	67
Hidden shaft mm	26	38	57
B non-thrust, connection hole diameter			
B1 (fixed bore) mm	42	60	80
B3 (fixed bore) mm	20	30	40
B4 (Max) mm	20	30	44
Handwheel reduction ratio			
Standard type	direct	direct	direct
Choice type	-	-	-
Flange standard	F10	F14	F16
Net weight kg	33	55	80



5.7.2

HKC03-HKC100 / HKM03-HKM55 / HKML03-HKML20

Actuator dimension data



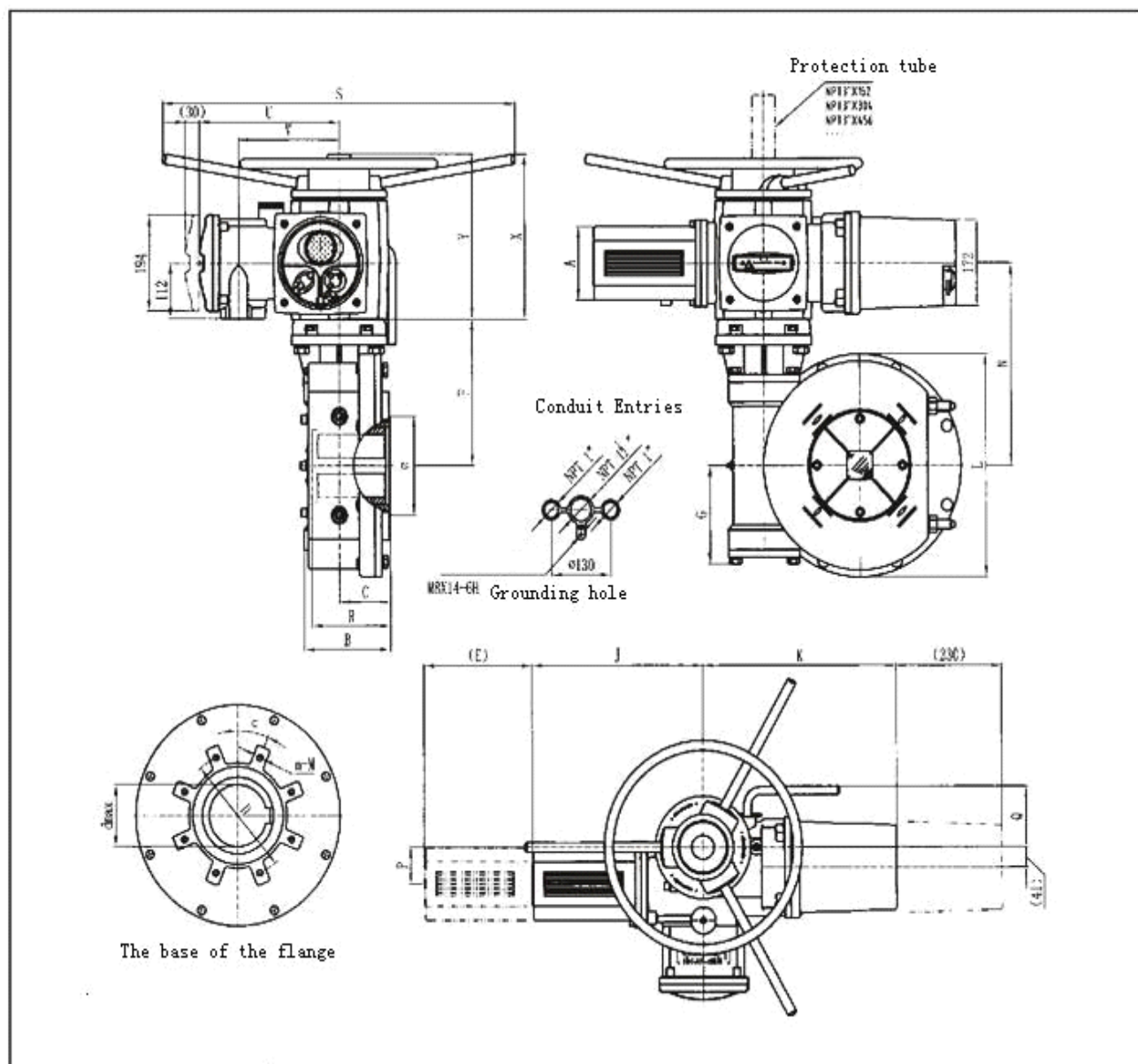
Parameter			A	E	J	K	Q	P	S	U	V	Y	X
Standard													
HKC03	HKM03	HKML03											
HKC08	HKM05	HKML05	102	198	264	373	110	41	Φ300	260	167	222	264
HKC14													
HKC20	HKM10	HKML10											
HKC30	HKM20	HKML20	134	210	297	390	110	60	Φ666	286	198.5	305	288
HKC40													
HKC60	HKM55		148	270	376	424	125	75	Φ784	310	222	334	335
HKC100			198	280	452	505	176	108	Φ820	358	269	392	415

* If you change the string "HKM" into "HKE", the above data is also suitable for the HKE range.

5.7.4

HKC -D / W HKM-W

Series HKC actuator combined with D/W one grade gear box



Standard \ Parameter		A	E	E	J	K	Q	P	S	U	V	Y	X
HKC03-14/H4	HKM03-05/W4	102	198	198	264	373	110	41	φ 300	260	167	222	264
HKC20-40/H4	HKM10-20/W4	134	210	210	297	390	110	60	φ 666	286	198.5	305	288
HKC20-40/H5	HKM10-20/W5												
HKC20/H6	HKM10/W6												
HKC20/H7	HKM10/W7												
HKC60/H7	HKM55/W7	148	270	270	376	424	125	75	φ 785	310	222	334	335

Standard \ Parameter		dmax	D	B	α	C	R	n-M	F	H	G	L	N
HKC03-14/H4	HKM03-05/W4	φ 64	φ 140	106	45°	50	93	4-M16	147	101.6	108	φ 218	230
HKC20-40/H4	HKM10-20/W4			134		65	120	4-M20	197	135.89	134	φ 285	248
HKC20-40/H5	HKM10-20/W5	φ 76	φ 165	134	22.5°	65	120	4-M20	197	135.89	134	φ 285	298
HKC20/H6	HKM10/W6	φ 102	φ 254	147		70	130	8-M16	186	177.8	144	φ 375	303
HKC20/H7	HKM10/W7	φ 127		181		87	160		276	209.55	196	φ 450	377
HKC60/H7	HKM55/W7			289									

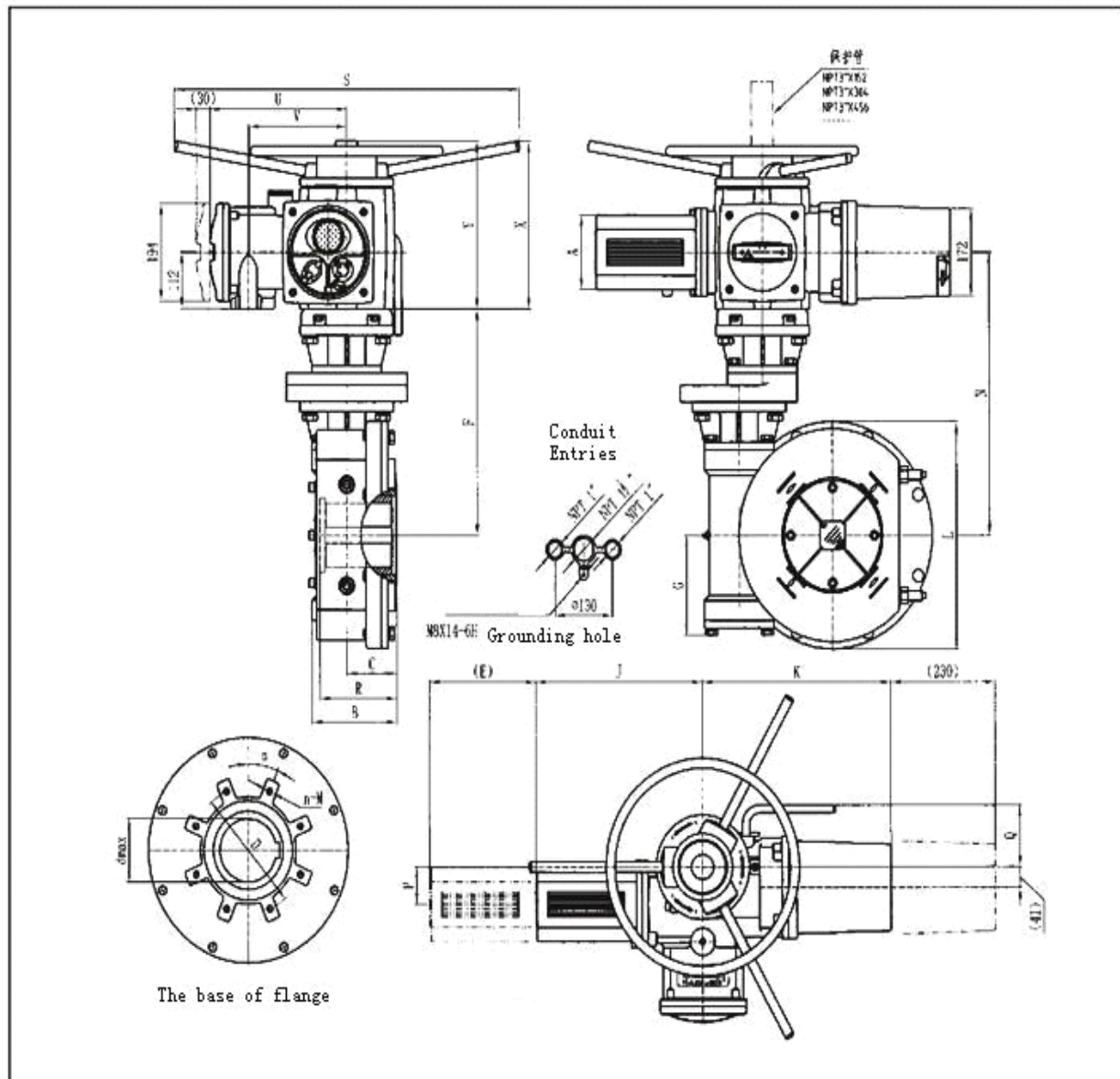
The character "H" includes series D or W gear-box in the above data table.

* If you change the string "HKM" into "HKE", the above data is also suitable for the HKE range.

5.7.5

HKC -DR / WR HKM-WR

Series HKC actuator combined with two grades gear-box



Parameter		A	E	J	K	Q	P	S	U	V	Y	X
HKC03-14/H4R	HKM03-05/W4R	102	198	264	373	110	41	φ 300	260	167	222	264
HKC20-40/H5R	HKM10-20/W5R	134	210	297	390	110	60	φ 666	286	198.5	305	288
HKC20-40/H6R	HKM10-20/W6R											
HKC20-40/H7R	HKM10/W7R											
HKC20-40/H8R	HKM10/W8R											
HKC60-H8R	HKM55/W8R	148	270	376	424	125	75	φ 785	310	222	334	335

Parameter		dmax	D	B	α	C	R	n-M	F	H	G	L	N
HKC03-14/H4R	HKM03-05/W4R	φ 64	φ 140	106	45°	50	93	4-M16	274	101.6	108	φ 218	341
HKC20-40/H5R	HKM10-20/W5R	φ 76	φ 165	134		65	120	4-M20	324	135.89	134	φ 285	425
HKC20-40/H6R	HKM10-20/W6R	φ 102	φ 254	147	70	130	8-M16	177.8		144	φ 375	425	
HKC20-40/H7R	HKM10/W7R	φ 127		181	87	160		466		209.55	196	φ 450	578
HKC20-40/H7R	HKM10/W8R	φ 153		194	22.5°	95		170		496	246.38	226	φ 520
HKC60/H8R	HKM55/W8R								608				

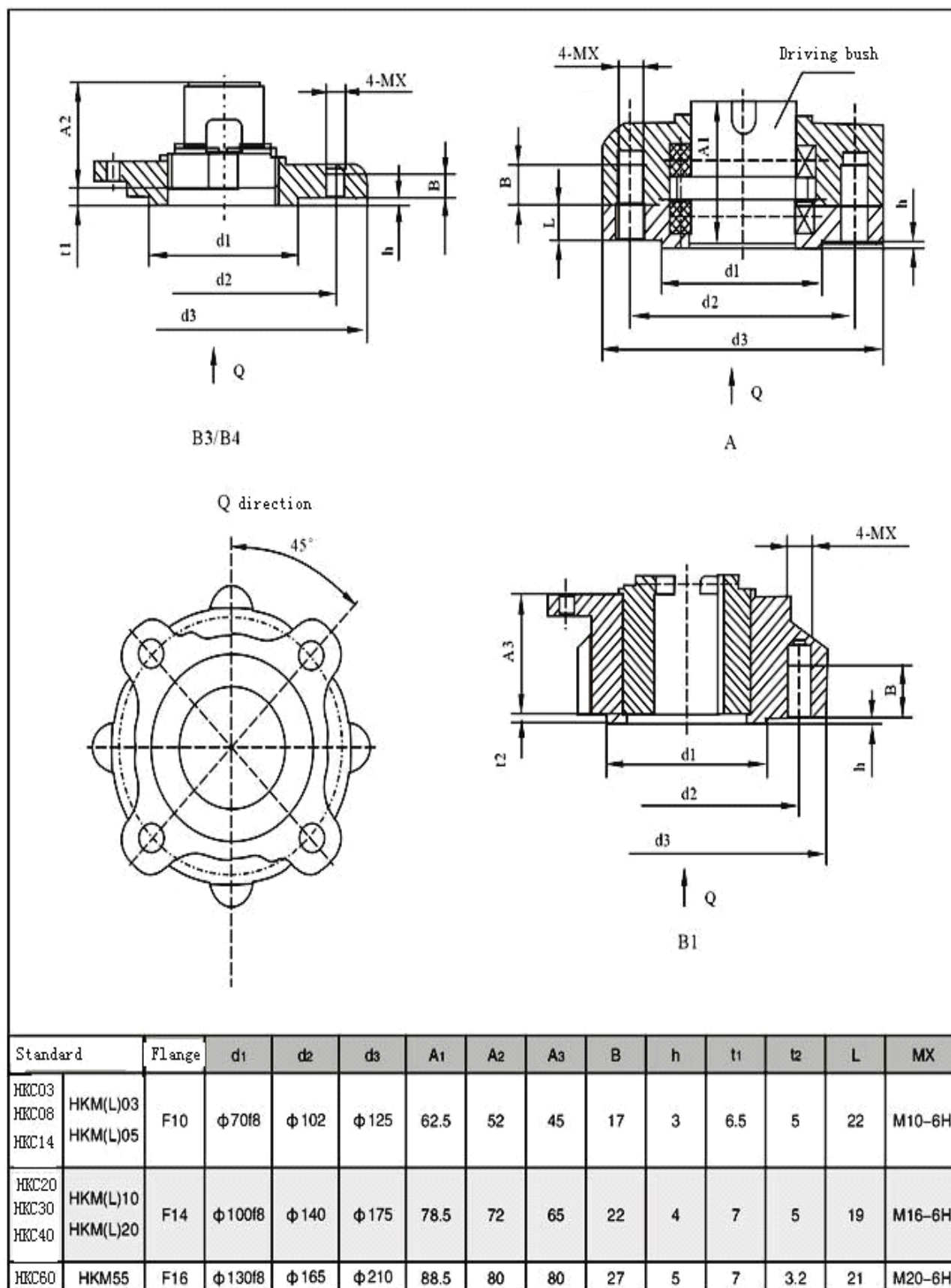
The above table is only the part, if you want to get more, please contact us!

* If you change the string "HKM" into "HKE", the above data is also suitable for the HKE range.

5.7.6

F10 / F14 / F16 Coupling flange

HKC03-HKC60 / HKM03-HKM55 / HKML03-HKML20



* If you change the string "HKM" into "HKE", the above data is also suitable for the HKE range.

6: Actuator Control and wiring (this section is suitable for HKC range)

The wiring code card fixed in the terminal cover is particular to each actuator. The HKM actuator wiring code, please refer to diagram 7. The means of each terminal refer to the diagram 6-1.

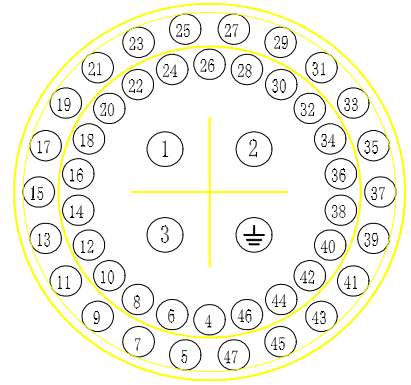


Diagram 6-1

6.1 Local controls

Non-intrusive selectors are provided on the actuator electrical control cover, one for local/stop/remote selection, pad-lockable in each position, and the other open/close control. Local control may be configured for maintained or push to run operation.

6.2 Remote manual controls

The power supply of remote control circuits can be provided as DC 24V by actuator internal supply or DC/AC 24V~60V, AC 120~220V by external supply.

Refer to the circuit diagram 6-1 to 6-3.

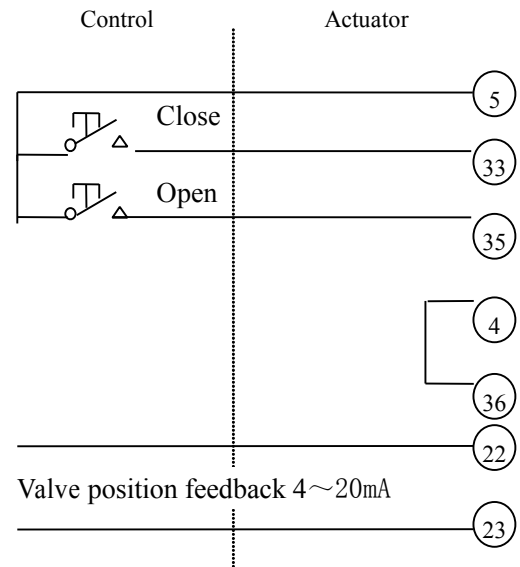
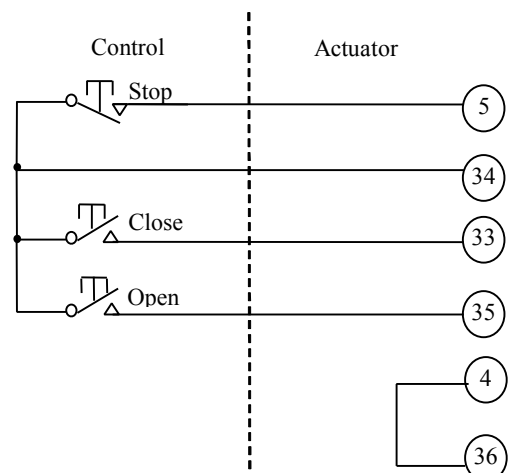
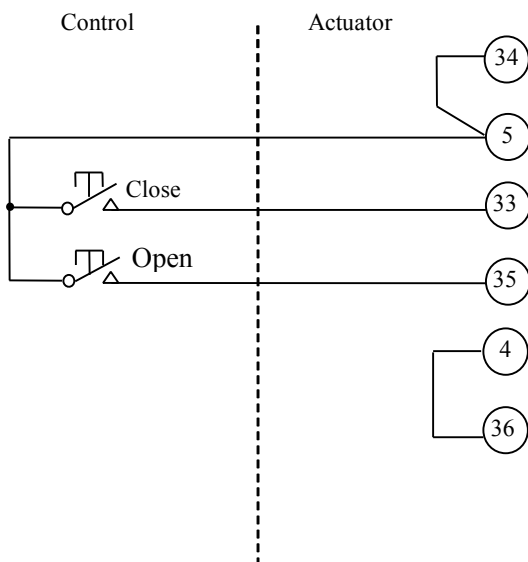


Diagram 6-1 push to run open/close control



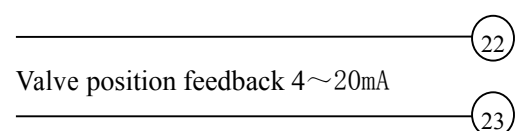
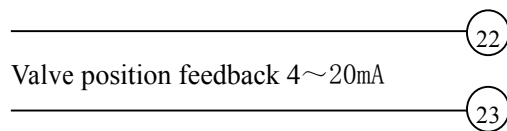


Diagram 6-2 maintain open/close control, support reversion, intermediate position impossible

Diagram 6-3 maintain open/close/stop control

Table 6-1 terminals description

NO	NAME	OPERATION
$\frac{1}{\text{---}}$	Connect with crust	Connect with grounding
1	Power supply terminal	380VAC(or 220VAC) input terminal
2	Power supply terminal	380VAC(or 220VAC) input terminal
3	Power supply terminal	380VAC(or void) input terminal
4	DC 0V	DC 24V “-” output
5	DC 24V	DC 24V “+” output
6	S1 relay terminal 1	Indication S1 relay terminal 1
7	S1 relay terminal 2	Indication S1 relay terminal 2
8	S2 relay terminal 1	Indication S2 relay terminal 1
9	S2 relay terminal 2	Indication S2 relay terminal 2
10	S3 relay terminal 1	Indication S3 relay terminal 1
11	S3 relay terminal 1	Indication S3 relay terminal 2
12	S4 relay terminal 1	Indication S4 relay terminal 1
13	S4 relay terminal 2	Indication S4 relay terminal 2
14	Battery relay terminal 1	Indicate battery power is too low ,the relay contact 1
15	Battery relay terminal2	Indicate battery power is too low, the relay contact 2
16	Temperature relay terminal 1	Indicate motor temperature is high, the relay contact 1
17	Temperature relay terminal 2	Indicate motor temperature is high, the relay contact 2
18		
19	Remote relay terminal 1	Remote position indication relay , common terminal
20	Remote relay terminal 2	Remote position indication relay , normally close terminal
21	Remote relay terminal 3	Remote position indication relay , normally open terminal
22	Valve position feedback signal +	Valve position current analogue signal feedback terminal +
23	feedback signal common terminal	Valve position current analogue signal feedback terminal +
24	Torque feedback signal +	Torque current analogue signal feedback terminal 1
25	ESD	Emergent (ESD) active signal input terminal
26	Valve position input signal +	Valve position current analogue signal input terminal +
27	Valve position input signal -	Valve position current analogue signal input terminal -
28		
29	Open position relay terminal 1	Valve position fully open indication relay terminal 1
30	Open position relay terminal 2	Valve position fully open indication relay terminal 2
31	Interlock low voltage terminal	Interlock low voltage common-terminal
32	Interlock high voltage terminal	Interlock high voltage common-terminal
33	Remote close	Remote close input terminal
34	Stop/maintain	Stop/maintain input terminal
35	Remote open	Remote open input terminal
36	Remote low voltage terminal	ESD, remote open/close, stop/maintain low voltage common-terminal
37	Open interlock	Open interlock input terminal
38	Close interlock	Close interlock input terminal
39	Manual/automatic terminal	Manual/automatic signal input terminal
40	Remote high voltage terminal	ESD, remote open/close, stop/maintain high voltage common-terminal

41	Manual/auto low voltage terminal	Manual/automatic low voltage common-terminal
42	Monitor relay terminal 1	Monitor relay common terminal
43	Monitor relay terminal 2	Monitor relay normally close terminal
44	Monitor relay terminal 3	Monitor relay normally open terminal
45	Manual/auto high voltage terminal	Manual/automatic high voltage input terminal
46	Close position relay terminal 1	Valve position fully close indication relay terminal 1
47	Close position relay terminal 2	Valve position fully close indication relay terminal 2

6.3 State indication relay

Four state indication relay are provided, each one independently configurable using the HKM setting tool to signal one of the following:

- valve position

Fully open, fully close or any intermediate positions

- status

Valve opening, closing, moving

- valve alarms

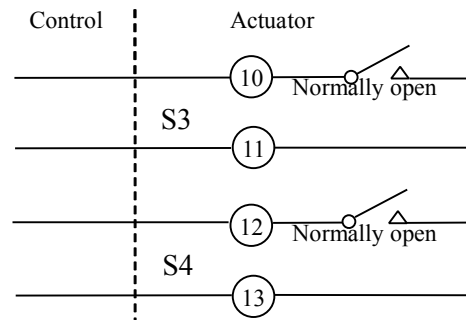
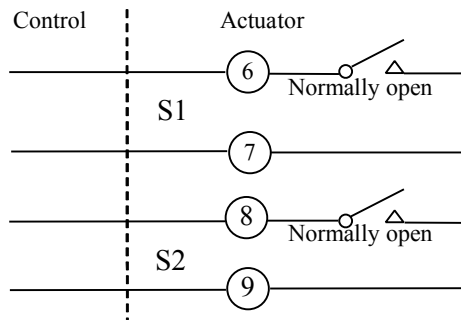


Diagram 6-10 state indication relays

Motor tripped on torque going open, going close, valve jammed

- actuators alarms

Battery low

Each contact can be configured to either “normally open” or “normally close”. Contacts are rated at 5A/250VAC or 5A/30VAC.

Refer to diagram 6-5.

6.4 Monitor relay

An independent relay with a volt-free changeover contact used for monitoring actuator electrical availability. Contact rating 5A/250VAC or 5A/30VAC.

The relay will de-energise under a one, or combination, of the following conditions:

- loss of one or more of the power supply phases
- main control circuit is error
- motor thermostat tripped

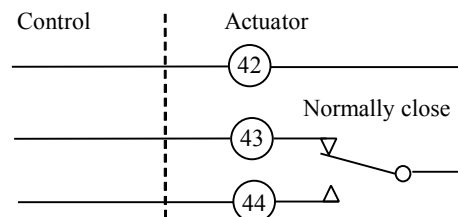


Diagram 6-11 monitor relay wiring diagram

- mode switch is not at the remote position

Refer to diagram 6-11.

6.5 Emergency shut down - ESD

An active ESD signal will override any local or remote control signal. The ESD input operates from a separate common to that used for open, close.

The following ESD options can be configured:

- ESD signal

Active high, active low

- ESD action

Close, open

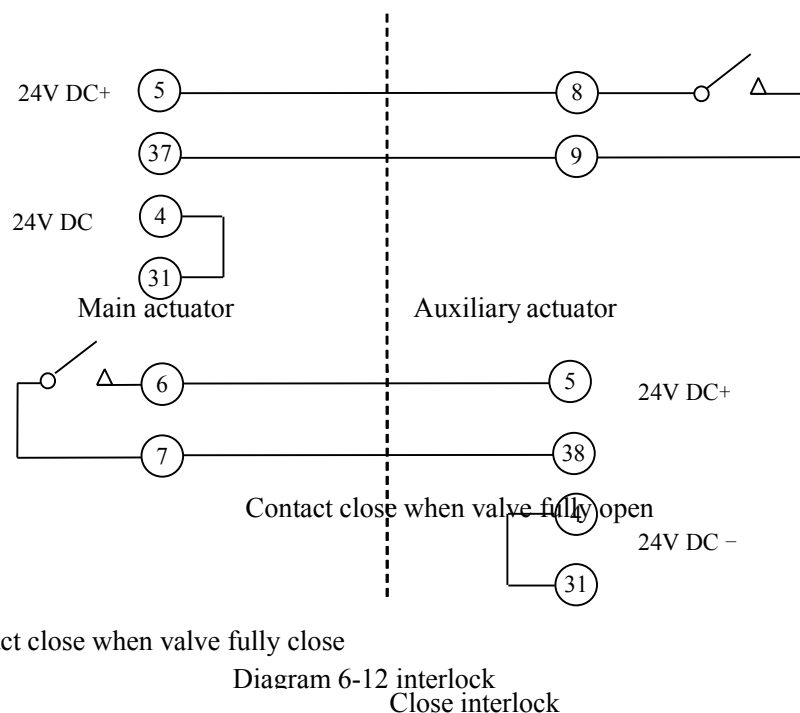
- ESD override

Motor thermostat

6.6 Interlocks

External hardwired interlocks for opening, closing or both directions can be configured to inhibit local and remote operation until the external contacts are made. Interlock circuits may be added with any of the remote control circuits. The interlock inputs operate from a separate common allowing for isolation between the safety system and operation control system.

Refer to Diagram 6-12.



6.7 HKM/HKC actuator extra functions option

Refer to Table 6-2.

Table 6-2 HKM/HKC actuator addition circuit and wiring diagram number

Item	Extra functions					Wiring diagram number
	1	2	3	4	5	
Base Circuit	Battery low, remote control select and thermostat tripped alarm relay	Valve position fully open and valve position fully close indication relay	Analogue signal input	Valve position signal feedback	Torque signal output	
√	—	—	—	—	—	100-00
√	√	—	×	×	×	101-xx
√	—	√	×	×	×	102-xx
√	√	√	×	×	×	103-xx
√	×	×	√	—	—	1xx-01
√	×	×	—	√	—	1xx-02
√	×	×	√	√	—	1xx-03
√	×	×	—	—	√	1xx-04
√	×	×	√	—	√	1xx-05
√	×	×	—	√	√	1xx-06
√	×	×	√	√	√	1xx-07

NOTE: “—” means you do not select; “√” means you already select; “×” means you can select.

Example: If you selected 1,3,4 functions, the wiring diagram number is 101-03.

6.7.1 Alarm relay

The extra alarm relay option provides five additional changeover relays. The extra alarm relay functions are show below:

- valve position fully open
- valve position fully close
- battery low
- remote control select
- thermostat tripped

6.7.2 Analogue signal input/output Module

The analogue signal input/output board provides a non-contacting internally fed 4 ~ 20mA analogue signal pronterfaceional to valve position. Available at terminals 22 and 23, the maximum external impedance that may be connected to the signal is 500 ohms at nominal supply voltage.

Analogue signal input impedance:

4mA ~ 20mA/250 ohm; 1VDC ~ 5VDC/1M ohm; 2mA ~ 10mA/250 ohm; 0.5VDC ~ 2.5VDC/1M ohm

6.8 Analogue signal control

The HKM actuator analogue signal pronterfaceional controllers enable the actuator to automatically position a valve in pronterfaceion to an analogue current or voltage. A signal derived from the actuator non-contacting position sensor is electronically compared with a signal pronterfaceional to the input signal. The difference between them triggers the open or close contactor in the direction that will cancel the error. Valve position is therefore automatically adjusted in pronterfaceion to analogue signal. Unnecessary frequent operation can be prevented by the adjustable deadband and the Motion inhibits Timer features.

- Position corresponding to low input signal: close limit or percentage open
- Position corresponding to high input signal: open limit or percentage open
- deadband: 0.1 ~ 9.9% of travel between open and closed limit positions
- motion inhibit time: 0.1 ~ 9.9 sec between actuator movements
- action on loss of input signal: stay-put, move to high or low signal position. Response on loss of signal will occur if signal falls below 50% of set “low” signal.

6.9 Pulse control

In the omputercontrol system, the user may be used the pulse control the actuator. HKM actuator are fitted this control mode.

Please refer to diagram 6-14

$$\frac{18 \times 10^4}{32N} > \text{Pulse length} > \frac{6 \times 10^4}{32N} \text{ ms}$$

- the interval of pulse must according to maximum 1200 starts per hour and 50% working time.
- Pulse width according to the output rpm N

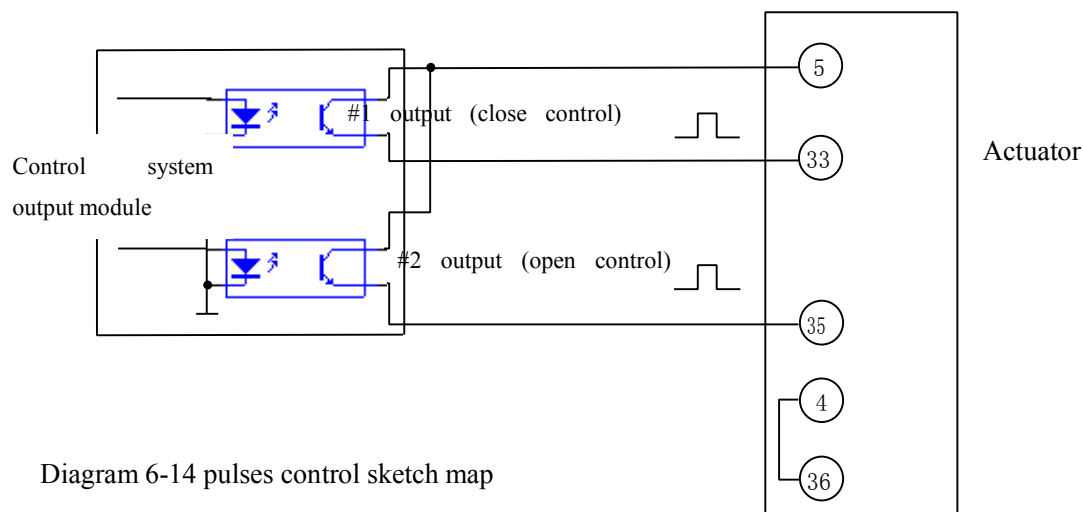


Diagram 6-14 pulses control sketch map

6.11 Field bus control

6.11.1 Modbus communication

Signal or dual MODBUS modules may be included in the HKM actuator to provide remote serial communication to the control functions and for status feedback data. The field network uses an RS485 data highway, either 2 or 4 wires, and can be duplicated where redundancy is required. The communication is half duplex and the protocol used is Modbus RTU with data rates up to 38 K baud. The actuator variables necessary to set up the system are programmable over the infra-red data link.

Modbus module advantages:

- cable cost reduction
- installation cost reduction
- simple to configure
- simple to use
- widespread open standard protocol
- many compatible devices available
- redundant configuration available

6.11.2 CAN bus communication

The CAN bus uses CAN2.0B protocol, it is based on ISO/OSI. The signal transmission medium is the twisted-pair, the great communication speed is 1Mbit/s, the great distance of the communication is 10Km (5kbps), the bus can link 110 actuators maximally.

6.11.3 Profibus communication

Profibus connectivity is possible by fitting the DP interface module within the HKM actuator, this allows the HKM actuator to be integrated into a standard Profibus network. Full compatibility with the fieldbus standard EN 50170 is provided and the module carries Profibus certification for inter-operability. The network allows full control of the actuator and feedback of status data to the host. The HKM actuator Profibus module has two communication interfaces to facilitate redundant fieldbus wiring where reliability is paramount, data rates up to 1.5 M baud are supinterfaced.

Profibus module advantage

- cable cost reduction
- installation cost reduction
- simple to configure and use
- devices independently approved
- widespread open standard protocol

- large number of compatible devices available
- redundant configuration available

6.11.4 Foundation Fieldbus communication

HKM actuator may be connected to a Foundation Fieldbus network by the inclusion of a HKM actuator FF module. The device complies with fieldbus standard IEC 61158-2, using a 2 wire electrical connection to the highway and has been certified for inter-operability. The foundation highway exchanges data and control between devices and full actuator functionality is available. Each actuator has full link scheduler capability and function blocks for analogue and digital inputs and outputs as well as PID and the standard transducer block. Foundation Fieldbus networks are capable of operating without a host system as a supervisor, the field devices communicating directly between themselves.

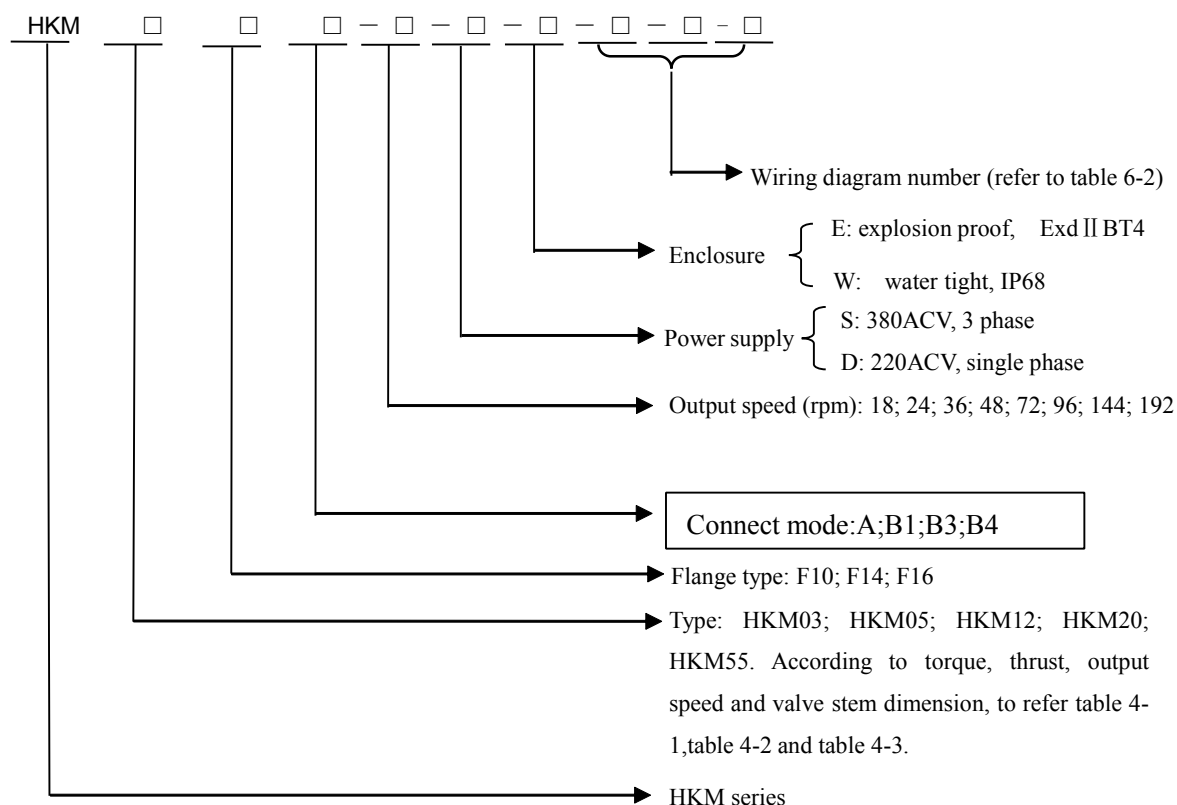
Foundation fieldbus module advantages:

- open standard protocol
- cable cost reduction
- installation cost reduction
- simple to configure and use
- access to the transducer block provides comprehensive diagnostic data
- simple communications on plug and play basis

7 Order Introduces

Model designation must be noted the each item, for example the wiring diagram number means the actuators versions, and if you require order a gearbox, you need to fill upon its model number.

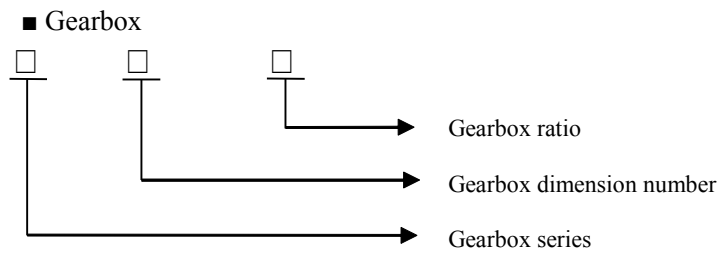
- Actuator model number



Example: HKM20F14A-24-S-W-101-03

Means: actuator modulating torque: 152N.M; flange type: F14; drive bush type: A; output speed: 24; Power supply: 380ACV; enclosure: IP68 water tight; appending analogue signal input, valve position signal feedback,

battery low alarm relay, remote control select alarm relay and thermostat tripped alarm relay.



Detail information can be found on the corresponding technical data sheets.

Example: W5- 40: 1

Means: W series; dimension number: 5; gearbox ratio: 40:1.

Even if the actuator and gearbox are provided all together, the model of the gearbox is not marked on the identification plate of the actuator. There is an individual identification plate on the gearbox; on it marked with model of the gearbox and so on.

Important notice: in order to advance the orientation precision, popularly you do not select the exorbitant output rotate speed. Here's a advice : the stroke time is not less than 25 seconds.

8、Machining of the Drive Bush

8.1 Thrust Base Type :

1) Turn actuator onto its side, remove the two cap-headed screws holding base plate onto thrust base, pull out the drive bush complete with its bearing assembly. Remove the thrust bearing of the drive bush's double end (The two thrust bearing stop ring near the mid bulgy – shoulder of the drive bush may not be removed.) (Refer to diagram1-1 ,1-2).

2) According to the thread dimension of the valve stem, machine the internal screw thread of the drive bush.

3) Remove all swarf from the drive bush and others that removed, ensuring that they are in good condition, clean and greased. According to the above steps, with adverse steps we can refit the drive bush and base assembly on the actuator, ensuring that the slots in the drive bush are located into the drive dogs of the hollow output shaft. (The bearing modules must be topped up lubricating oil).



diagram 1-1

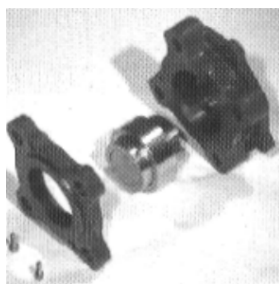


diagram 1-2

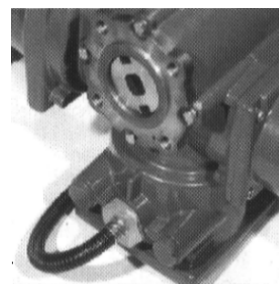


diagram 1-3

8.2 Non-Thrust Base Type (Refer to diagram 1-3).

1) Turn actuator onto its side, remove the base, the retaining clip on top of the drive bush can be seen now.

2) Turn the retaining clip slots until reach the drive dogs of the output shaft, or with the screwdriver seek out the retaining clip, we can remove the drive bush. According to the connection mode of the configured value, we can machine the hole of the drive bush shaft, key seat or combinative-dogs, and refit them assembly on the actuator. Then fit on the retaining clip and base. Before fitting on the base, must daub between base and drive bush with any lubricating – oil.

9、Installation of the actuator

9.1 Installation with the visible stem valves:

9.1.1 Install the Thrust Base Type:

1). When leaving factory, according to the requests of the clients the screw thread inside the drive bush has been machined well. As a combination of actuator and drive bush, it is assembled with valve.

Firstly let the hand – operating step available, then place the actuator onto valve, put the screw thread of the actuator and the valve stem in order, wind the handwheel in the opening direction to engage the drive bush

onto the stem. Continue winding until the actuator is firmly down on the valve flange. Wind two further turns, fit securing bolts and tighten fully.

2). If the clients machine the internal screws of the drive bush, according to above 1.1, machine and fit in the drive bush. According to the above “ a ”, fit them assembly.

9.1.2 Installing the Non – thrust Base Type

Ensuring that the drive bushes of the non- thrust type have been machined, then fit the actuator and valve as a combined unit.

Firstly let the hand – operating step of the actuator available, then place the actuator onto the valve, let the valve stem into the hole of the drive bush, or the combinative – dog of the drive bush is secured to the combinative – dog of the valve, wind the handwheel in opening direction until the actuator is firmly down on the valve flange. Wind two further turns, fit securing bolts and tighten fully.

9.2 Installation with the valve with gear case

Firstly checking that the drive bush, input shaft, key and key seat are all appropriate or not, fit the base and drive bush assembly on the actuator firstly, then place the actuator onto the flange of the gear case correctly, let the input shaft of the gear case into the hole of the drive bush shaft, wind the handwheel, ensuring that the key is located into the key – seat of the drive bush, then fit securing bolts and tighten fully.

9.3 Installation with the hidden – stem valve

Popularly according to the 2.1.2, use the same way to assembly. But if the actuator will support thrust, we should use the thrust – type connection with thrust bearing.

9.4 Handwheel Sealing

Ensuring that sealing plug in center of handwheel is sealed with PTFE tape and fully tightened, ensuring that moisture does not pass down the output shaft of the actuator.

9.5 Connecting to Terminals and Cable Entry

1. According to the control orders, connect the power wires and signal wires.
2. The actuator has expert earth terminals, in order to ensure that persons and equipments are safe, the actuator should be earthed credibly.
3. Only appropriate certified Explosion – Proof entry reduces, glands or conduit may be used in hazardous locations. Ensure that threaded adaptors, Seal unused cable entries with a steel or brass threaded plug. In hazardous areas an appropriately certified threaded blanking plug must be used.

9.6 Mounting the LCD Screen Correctly

When the actuator is located on the different orientations, in order to make the actuator have the natural direction of the LCD display, that is to say the characters have natural display direction, the LCD screen of the actuator provides four sorts of settings:

1. Installing the actuator in the horizontal direction (operating handwheel is upturned), the LCD screen is mounted with a natural position.

2. The actuator is installed conversely (operating handwheel is gadarene), the charactors are displayed reversely.

3. Installing the actuator in the leftward direction (operating handwheel is leftward), the LCD screen is mounted near by the side of the flange.

4 Installing the actuator in the rightward direction (operating handwheel is rightward), the LCD screen is mounted near by the side of the flange. The charactors are displayed reversely.

10. Operating your Actuator

10.1 Operation by hand

The actuator provides operating handwheel and Electrical/Handwheel lever, when the actuator is in the special instance, e.g. main power failed or the control circuit failed and so on, we can operate the actuator by hand. Before operating the handwheel, firstly let the mode selection switch be in the “ stop ”or “ local ” position. To engage handwheel drive depress the Electric/hand lever into “ Hand ” position and turn the handwheel slowly to engage the clutch. When the actuator has been in the “ Hand ”step, the lever can now be released and return to the free position by its clockwork spring. But the internal clutch has been latched up in the “ Hand ” position. Now wind the handwheel and the output shaft will be driven, thus is the hand operating.

The clutch is ably designed, it prefers electric operation to hand operation. When the motor turning the clutch will switch to the electric operating position automatically.

The switching lever may be latched up in the electric operating position or the hand operating position by the padlock. Please notice : if the lever is latched up in the hand operating position by the padlock, the turning of the motor can not let the clutch switch to the electric operating position automatically.

10.2 Local Operation

If you want to use local operation, you should let the mode selection switch (red switch)lie to the local position and control the actuator by the operation switch (black switch). There are two kinds of work mode for the local operation: push to run and maintained, these are set by the setting tool. Details as follows:

Push to run : when you let the operation switch (black switch) lie to the closing position, the actuator will act towards the closing direction. When you release the operation switch, the operation switch will return to the original position, the action towards the closing direction will be stopped. When you let the operation switch lie to the opening position, the actuator will act towards the opening direction. Releasing the operation switch, it will return to the original position and the actuator will stop running immediately.

Maintained: let the operation switch locate in the closing position and if you release the switch, it will return to the original position, but the actuator maintains acting towards the closing direction. As for opening operation, you let the operation switch locate in the opening position, even if you release it and let it return to the original position, the actuator will maintain acting towards the opening direction.

10.3 Remote Operation

Details see the above.

11. Debugging your Actuator

11.1 Intrinsically Safe Setting Tool.

The setting Tool allows parameters to be configured with non – invaded mode to suit the requirements, it allows parameters to be checked and failures to be diagnosed. If you want to use the setting Tool, you must let the Mode Switch locate in the “local” or “Stop” position beforehand. When a button is depressed the Setting Tool transmits the relevant instruction to the actuator by infra – red pulses and must therefore be directly in front of the actuator indicator window and at a distance no greater than 1.00m.

↓ : Downward Shift Button. It is used for selecting the next item of the current menu and it circulates round the current menu from one item to another. That is to say, when the current cursor points to the last item, depress this button again, the current cursor will return to the first item of the current menu.

+ : Plus Button. Increase / Change display function’s value or option setting.

- : Minus Button. Decrease / Change displayed function’s value or option setting.

↵ : Enter Button. Enter displayed value or option setting.

↶ : Return Button.. Return from current menu to upper menu.

R: Reset Button. When the actuator enters into trap contingently, depress this button , the Setting Tool will transmit a hardware resetting signal to the actuator and the actuator will recover to the nomal program circles.

Notice: When you let the Mode Switch locate in the “local” position, depressing the “+”button and “ ↓ ” button synchronously the actuator will execute “Local Opening” action, depressing the “-” button and “ ↵ ” button synchronously the actuator will execute “ Local Closing”action.

Setting Tool Model: HKC/HKM;

Explosion – Proof Mark: Exia II CT4;

Explosion – Proof Certificate Number:

Working Condition: Temperature: -30℃ ~+50℃ ,Opposite Humidity: ≤95%, Atmosphere pressure :0.86 MPa ~1.06 MPa, Power Supply: two common batteries with size 5.

Attention for the use of the Setting Tool: 1. No removing the back cover in the hazardous area; 2. No replacing or altering the components and configurations if they affect the Explosion – Proof capabilities of the Setting Tool; 3. Should cleanout the Setting Tool with the cleaning agent or dank cloth.

Please notice: If the Mode Switch is lying in the “ Remote ” position ,or lying in “ Local” position but the motor is running , or the motor stops but still in the “No Acting” time, the Setting Tool is not available.

11.2 The Actuator Display

On power up and initialize the actuator’s liquid crystal display (LCD) screen will show percentage open with big font (figure 11-2), the icon of the battery’s electrical voltage is on the top right corner, alarm icon is on the bottom right corner. When the valve reaches to the limited position, show the valve’s open percent with the simulant icon of the butterfly valve (Figure 11-3a,b).

When a any button (not include “Reset Button”) is depressed directly in front of the actuator indicator window, the LCD screen will show main menu. From the main menu you can enter into parameters setting, parameters checking and status interrogating menu. Entering into menu, the LCD screen is divided into four areas: Menu Area (Parameters Setting, parameters checking and status interrogating), Alarm Area, Clew Area

and Battery Status Display Area.(Figure 11-4).

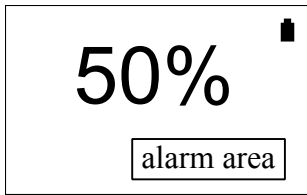


figure 11-2

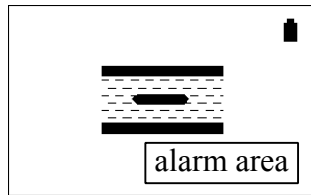


figure 11-3a

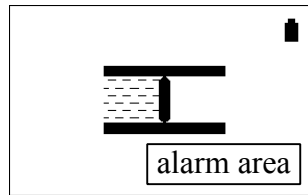


figure 11-3b

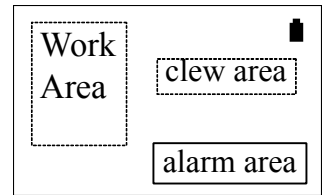
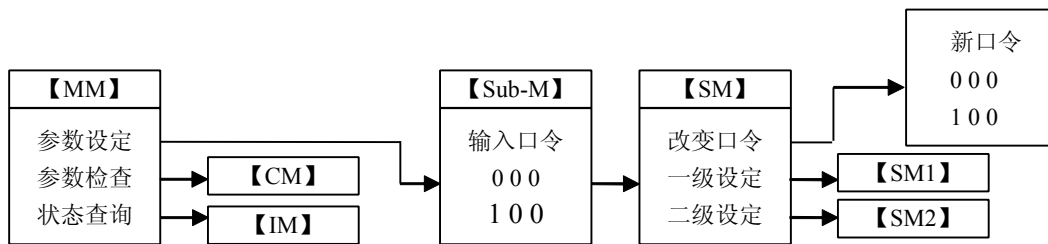


figure 11-4

11.3 Main Menu

Notice : In order to make the latter depiction and reading advantageous, the selected item is bracketed by “[]” brackets. The selected item is shown reversely (that is black underside and white words), the not selected item is shown generally (that is white underside and black words). By the way, “MM”—means “Main Menu”, “SM” — means “Setting Menu”, “CM”—means “Checking Menu”, “IM”—means “Interrogating Menu”.



11.4 Parameters Setting [参数设定]

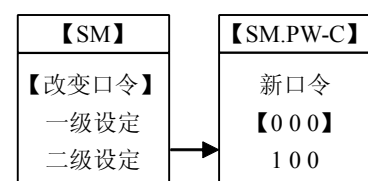
Before natural working we must configure the work parameters for the actuator in advance.

In the “MM” menu , use“↓” button to select the “参数设定” item, enter into “Sub-M” menu. In order to prevent the non – accredited person from changing the function setting, the actuator provides the password function. The “Sub-M” menu indicates that the operator must input password. The password is from 000 to 255.

If you enter the correct password in the “Sub-M” menu. And depress the “↵” button, you can enter into “SM” menu. In this submenu there are four items: (1) [改变口令]Changing Password; (2) [一级设定]Primary Setting; (3) [二级设定]Secondary Setting.

11.5 Changing Password [改变口令]

The **Changing Password [改变口令]** item allows the operator to change the primary password and enter new password over again. In the “SM” menu, you can set the new password value from 000 to 255. If the **New Password [新口令]** is in the range from 000 to 099, shift the cursor to row 000 and change it with “+”, “-” button. If the new password is in the range from 100 to 255, shift the cursor to row



100 and change it with “+”, “-” button. When the shown passwords are the value that you require, depress the “↵” button and confirm the password.

Notice : In the latter parameters setting, if no special explanation, after confirming the setting parameters, only when the displayed word “已存”(this words are displayed in the Clew Area) flashes, the actuator will receive this setting and return back to the upper menu.

11.6 Primary Setting [一级设定].

In the “SM” menu, use “ ↓ ”button select the Primary Setting[一级设定] item and depress the “↵” button, enter into “[SM1]” menu.

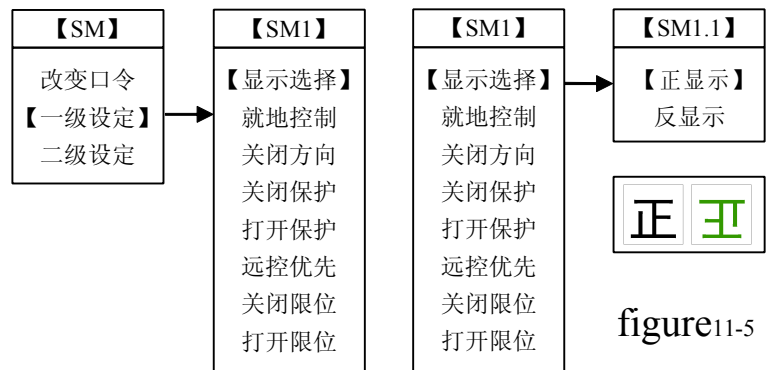


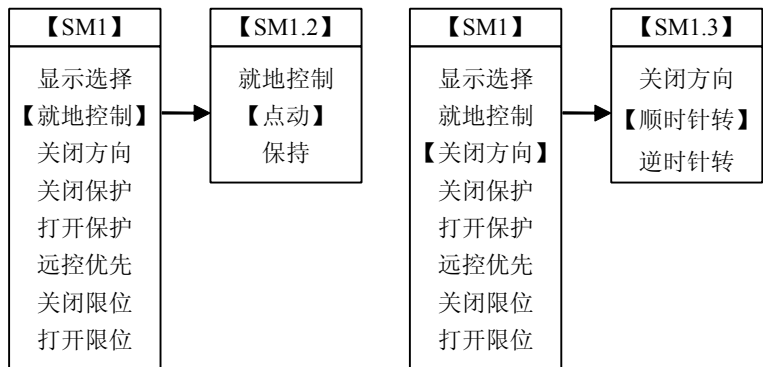
figure11-5

11.6.1 Setting of the Display selection [显示选择]

When the actuator's installing direction is reverse with our line of sight, this option is used to adjust it in order to make the menu converse to be seen naturally. In the “SM1” menu, use “ ↓ ” button to select **Display Selection**[显示选择] item, depress “↵” button and enter into “SM1.1” menu. The LCD screen's **Natural Display**[正显示] and **Reverse Display**[反显示] are shown in the figure 11-5.

11.6.2 Local Control Mode [就地控制]

In the “SM1” menu, use “ ↓ ”button to select **【就地控制】(Local Control)** item, depress “↵” button and enter into “SM1.2” menu. You can select **Push to Run**[点动] or **Maintained**[保持]. Select the required mode and depress “↵” button, the menu will return to the “SM1” menu automatically.



11.6.3 Direction to Close [关闭方向]

We can select the running direction of the output shaft by the **【关闭方向】(Direction to Close)** item. In the “SM1” menu, use “ ↓ ” button to select **Direction to Close**[关闭方向] item, depress “↵” button and enter into “SM1.3” menu. You can select the required closing-direction by the “ ↓ ” button. When select **Clockwise to Turn**[顺时针转] item the output shaft will clockwise turn; by contraries, it will anti-clockwise turn.

11.6.4 Closing Protection [关闭保护]

This item is used to select the values of the over torque protection and decide that if the limited position protection is required or not.

In the “SM1” menu, use “↓” button to select **Closing Protection** [关闭保护] item, depress “↵” button and enter into “SM1.4” menu, that is **Torque Protection** [保护转矩] item. You can select the required values of the torque protection (the range can be varied between 40% and

127% rated torque), depress the “↵” button and enter into “SM1.4.1” menu. In this menu, you also select the mode of the **Limit Protection** [限位保护] for the closing direction: that is “Yes”[有] or “No”[无]. Depress the “↵” button in order to actuator can receive these setting.

Explanation: If you select “No”[无] option as the **Limit Protection**[限位保护], when the actuator is closing, only if the torque is over the actuator will stop running. If you select “Yes”[有] option as the limit position protection, when the actuator closing, the Over Torque or **Limit Closed**[关闭限位] is detected, the actuator will stop running.

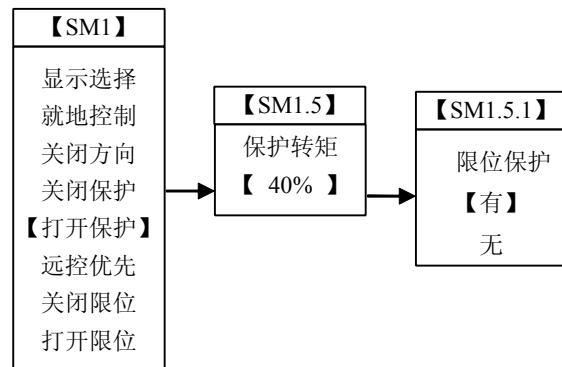
Notice 1: this item, refer to the last of the instructions----“Important Notices”.

Notice 2: If the over torque appears when the actuator is running in a certain direction, the actuator will register this information, even if the actuator resets or power up over again this note is still maintained and no running towards this direction is allowed. There are two ways to eliminate this note: (1) running towards reverse direction; (2) setting the torque protection value over again.

11.6.5 Opening Protection [打开保护]

This item is used to select the values of the over torque protection and decide that if the limit position protection is required or not. The setting way is similar to the one of the “closing protection”.

Refer to the following table for limit position protection or refer to the used valve for recommended selection.

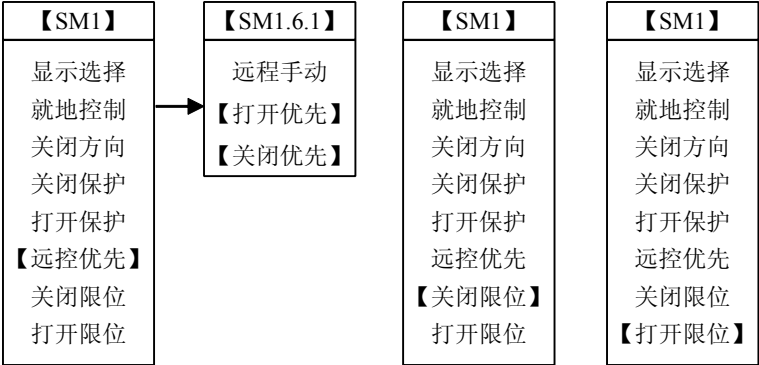


Valve Type	Closing Limit Protection	Opening Limit Protection
Wedge gate, Cate-off	No	Yes
Butterfly, Ball, Thru-conduit, Plug, Parallel Slide	Yes	Yes

11.6.6 Remote Control Priority [远控优先]

When the **Remote Opening**[远程打开] and Remote Closing[远程关闭] signal exist at the same time, this item is used to decide that who has the priority.

In the “SM1” menu, use “ ↓ ” button to select “ Remote Control Priority” item, depress “↵” button and enter into “ SM1.6.1” menu. Use “ ↓ ” button to select the relevant function. When select **Open Firstly**[打开优先], if **Remote Opening**[远 程 打 开] and **Remote Closing**[远程关闭] signal exist



at the same time, only execute the opening action. When select **Close Firstly** [关 闭 优 先], if **Remote Opening**[远程打开] and **Remote Closing**[远程关闭] signal exist at the same time, only execute the close action.

If you have selected your required item, you will depress the “↵” button and the menu returns back to the “SM1” menu.

11.6.7 Limit Closed [关闭限位]

When the actuator is lying in the Limit Closed position the **Limit Closed** [关闭限位] item is used to set the valve position value of this moment.

Turn valve manually to the full closed position. Allow for overrun by winding actuator output open up to one turn. In the “SM1” menu, use “ ↓ ” button to select the “Limit Closed” item, depress “↵” button and the actuator will receive the current valve position values. At this moment the red lamp should illuminate.

11.6.8 Limit Open [打开限位]

When the actuator is lying in the open limit position the **Limit Open** [打开限位] item is used to set the valve position value of this moment.

Turn valve manually to the full open position. Allow for overrun by winding actuator output closed up to one turn. In the “SM” menu, use “ ↓ ” button to select the **Limit Open** [打开限位] item, depress the “↵” button and the actuator will receive the current valve position values. At this moment the green lamp should illuminate.

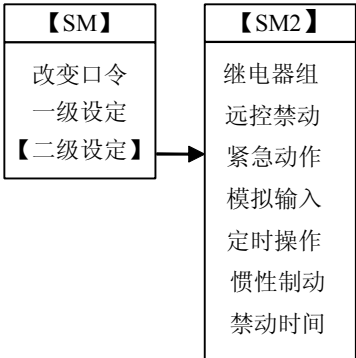
When you set the **Limit Open** [打开限位], from closed limit position to open limit position there are 3.5 turns at the least for the output shaft of the actuator, or else the actuator will not receive the settings.

Notice: You should set the Limit Closed[关闭限位] firstly then set the Limit Open [打开限位]. When you have set the “Limit Closed”, you must set the “Limit Open” over again, or else the actuator will not receive the settings and don’t work naturally.

11.7 Secondary Settings [二级设定]

The **Secondary Settings** [二级设定] are the higher level for the actuator, so that we can control the actuator in the higher level.

The Secondary Settings include: (1) **Relay Group**[继电器组]; (2) **Remote Control Inactive**[远控禁动]; (3) **ESD (Emergency shutdown)**[紧急动作]; (4) **Analog Input**[模拟输入]; (5) **Timing Operation**[定时操作];



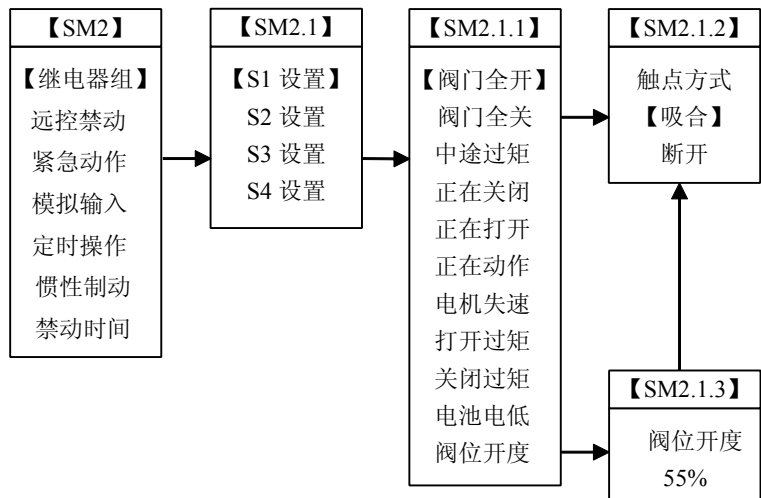
(6) **Inertia Trig**[惯性制动]; (7) **Inactive Time** [禁动时间].

11.7.1 Relay Group [继电器组] (that is indication relays S1, S2, S3 and S4)

S1 to S4 relay is used to indicate a certain given status of the actuator, that is one of the relay, S1 to S4, may be sprung by the one of the following status:

Closed End Position[阀门 全关],**Open End Position**[阀门 全开],**Torque Trip Mid-travel**[中途过矩],**Actuator Closing**[正在关闭], **Actuator Opening**[正 在 打 开], **Actuator**

Rotating[正在动作], **Motor Stalled**[电机失速], **Torque Trip Close**[关闭过矩], **Torque Trip Open**[打开过矩], **Battery Low**[电池电低], **Valve Position Open Percent**[阀位开度].

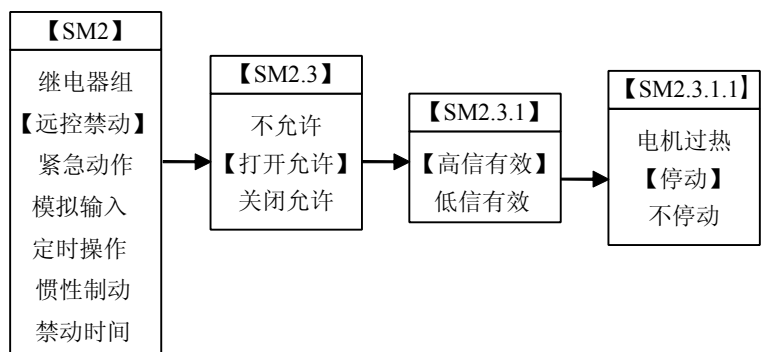


When the relay is sprung, the contact mode may be set normally open or normally closed .Make S1 as an exemplar: In the “SM2” menu we can select the “继电器组”, depress the “↵” button and enter into the “SM2.1” menu. Use the “↓” button to select “S1 设置”(S1 setting) item and enter into “SM2.2.1” menu. Use “↓” button to select the required contact mode and depress “↵” button.

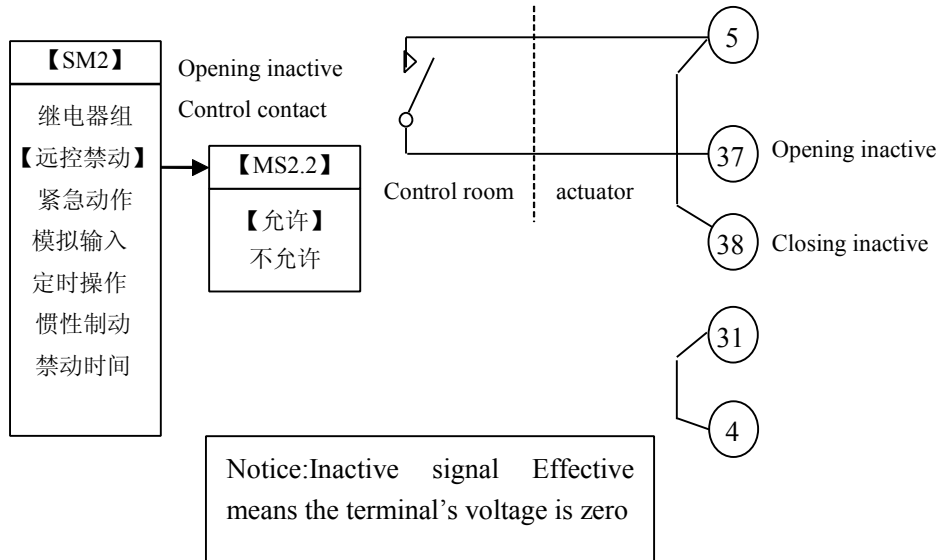
When you enter into “SM2.2.1” menu and select the **Valve Position Open Percent**[阀位开度], depress the “↵” button and enter into the “SM2.1.3” menu, use “+”, “-” button to select the valve position values, depress the “↵” button and enter into the “SM2.1.2” menu.

11.7.2 Remote Control Inactive [远控禁动]

This function is used to decide that the actuator is inactive or not by two wires .By the “↓”, “↵” button select the “**Remote Control Inactive**” [远控禁动] item, enter into “SM2.2” menu, this item is set as “**Allowed**” [允许] or “**Not Allowed**” [不允许]. When you set this item as [允许], actuator allows the inactive function for the



close direction and open direction has the inactive function, you should connect a jumper wire to the inactive signal terminal port of another direction. According to the right figure’s connection mode, you can realize the inactive function of the open direction (when the switch turn off), but there’s no inactive function of the close direction. If you set this item as “Not Allowed”, the inactive signal that is adscititious is not available.



11.7.3 ESD (Emergency Shutdown) [紧急动作]

This function is used to control the actuator's action in the emergent circumstances.

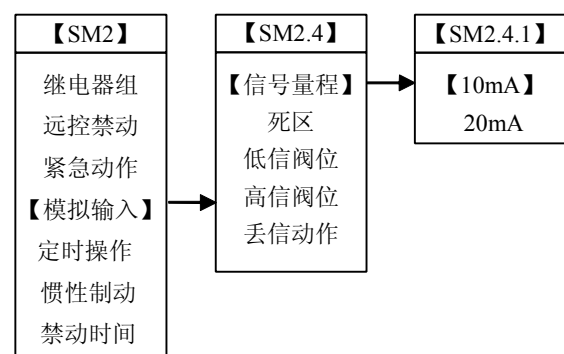
In the "SM2" menu, use "↓" button to select the **"ESD"** item, depress "↵" button and enter into "SM2.3" menu. You can select this item as **Not Allowed**[不允许] (ESD function is void), **Open Allowed**[打开允许] (the actuator will execute the open action when the ESD happens) and **Close Allowed**[关闭允许] (the actuator will execute the close action when the ESD happens). If you select **Not Allowed** [不允许] item, depress the "↵" button, return back to the "SM2" menu. If you select **Open Allowed** [打开允许] or **Close Allowed** [关闭允许] item, depress "↵" button and enter into "SM2.3.1" menu. In this menu if you select the **High-Voltage Active**[高信有效], when the ESD signal is high level the actuator can execute the ESD function; if you select the **Low-Voltage Active**[低信有效], when the ESD signal is low level the actuator can execute the ESD function. Depress the "↵" button and enter into "SM2.3.1.1" menu, this menu requires that the user must decide the selections when the ESD is active and the motor is over temperature. If you select **Not Stop Running**[不停动], when the ESD is active and the motor is over temperature, the actuator will run to the configured position, in this case the motor may be damaged. If you select **Stop Running** [停动] item, when the ESD is active and the motor is over temperature the actuator will not run.

The ESD function doesn't override the following functions: (1) **Limit Protection**[限位保护]; (2) **Over Torque Protection**[过矩保护]; (3) **Remote Control Inactive**[远控禁动]; (4) Mode Switch in the Stop Position.

11.7.4 Analog Input [模拟输入]

This function is used to control the actuator run to the appointed position by the external electrical current signal.

In the "SM2" menu, select the **Analog Input** [模拟



输入] item, depress the “↵” button and enter into “SM2.4” menu.

11.7.4.1 Signal Range [信号量程]

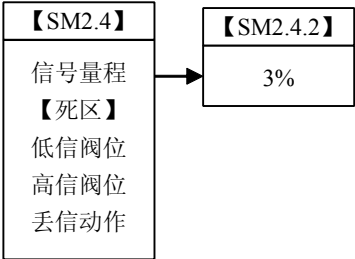
This function is use to select the range of the external DC analog electrical current or voltage that is inputted the actuator.

In the “SM2.4” menu, select the **Signal Range**[信号量程] item, depress the “↵” button and enter into the “SM2.4.1” menu. In this menu, the “10mA” means that the analog signal’s input range is between 2mA and 10mA / between 0.5VDC and 2.5VDC, another item is “20mA”, that means 4mA~20mA /1VDC~5VDC.

11.7.4.2 Deadband Adjustment

The deadband means that the least percent open of the valve’s position when the actuator runs again. This value is relative to the running stroke of the actuator.

In the “SM2.4” menu, select the **Deadband** [死区] item, depress the “↵” button and enter into the “SM2.4.2” menu. Use the “+” or “-” key to select the deadband width. The range is 0.1% ~ 9.9%.



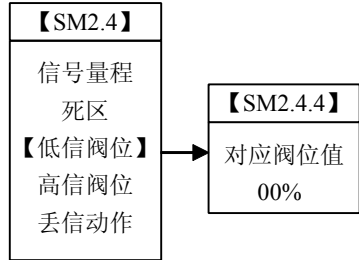
If the actuator hunts or responds unnecessarily to a fluctuating set point signal the deadband must be increased. If more accurate control is required the deadband may be decreased.

11.7.4.3 Valve Position Low Signal Settings

This function is used to set the low point signal of the analog electrical current input. It is used for the calibration account.

Input the low point signal to the sunflower connection terminals [27(-),26(+)]. In the “SM2.4” menu, select the **Valve Position of Low Voltage**[低信阀位] item, depress the “↵” key and enter into the “SM2.4.4”menu. Use “+” or “-” key to select the value, the range is 0~100%.

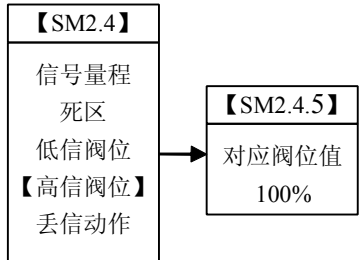
Depress the “↵” key, the actuator will register this value and take it as one of the emendation of the analog input signal.



11.7.4.4 Valve Position High Signal Settings

This function is used to set the high point signal of the analog electrical current input.

Input the high point signal to the sunflower connection terminals [27(-),26(+)]. In the “SM2.4” menu, select the **Vale Position of High Voltage**[高信阀位] item, depress the “↵” key and enter into the “SM2.4.5”

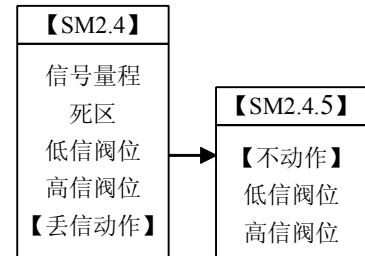


menu. Use “+” or “-” key to select the value, the range is 0%~100%. Depress the “↵” key, the actuator will register this valve and take it as another one of the emendation of the analog input signal.

11.7.4.5 Action On Loss of Signal

Action on loss of signal is used to select the actuator’s action mode when the analog electrical current signal lost.

In the “SM2.4” menu, use “↓” key to select the **Action On Loss of Signal**[丢信动作] item and enter into the “SM2.4.6” menu. Use “↓” key to select **No Action**[不动作], **Valve Position of Low Voltage** [低信阀位] or



Valve Position of High Voltage[高信阀位]. If you select **Valve Position of Low Voltage**[低信阀位], the actuator will run to the position corresponding to low point signal. If you select **Valve Position of High Voltage**[高信阀位] the actuator will run to the position corresponding to high point signal. When the input signal is less than half of the low point signal, we think that this is the loss of signal.

11.7.5 Timing Operation [定时操作]

The Timing Operation is an optional function. When the actuator is opening or closing, in order to make the actuator act intermittently, we use this “Timing Operation”. The timing operation enables pulsed “stop/start” operation by the actuator. This effectively increases the valve stroke time and can be adjusted to prevent hydraulic shock (water hammer) and flow surges in pipelines.

In the “SM2” menu, use “↓” key to select the **Timing Operation**[定时操作] item, depress the “↵” key and enter into the “SM2.5” menu, to select **Allow**[允许] or **Not Allowed**[不允许]. Select **Allowed**[允许] and enter into “SM2.5.1”. Use the “↓” key to select the **Timing Position**[定时位置] item, enter into the “SM2.5.1.1” menu. Use “↓” key to select the **Open Position Effective**[开位有效] item, depress the “↵” key and enter into the “SM2.5.1.1.1” menu, Use “+” or “-” key to select the **Valve Position to Stop**[停动阀位] and **Valve Position to Start**[起动阀位], then use “↵” key to return back to the “SM2.5.1” menu. If you select the **Close Position Effective**[关位有效]. In the “SM2.5.1” menu, select the **Active Time**[动作时间] item and enter into the “SM2.5.1.2” menu. Use “+” or “-” key to set the time. “Inactive Time” item’s setting is similar to the “Active Time” item. The range of active / inactive time is 1~99 seconds.

Open Position Effective[开位有效] is the pulsing operation when the actuator acts intermittently around the open limit position.

Close Position Effective[关位有效] is the pulsing operation when the actuator acts intermittently around the closed limit position.

Active Time[动作时间] is the duration when the actuator executes the “Timing Operation” function.

Inactive Time[禁动时间] is the rest time when the actuator executes the “Timing Operation” function.

Valve Position to Stop[停动阀位] is the valve position that the close position is effective and that after

the opening action when the actuator stops the “Timing Operation” function; or the valve position that the open position is effective and that after the closing action when the actuator stops the “Timing Operation” function.

Valve Position to Start[起动阀位] is the valve position that the close position is effective and that after the closing action when the actuator starts the “Timing Operation” function; or the valve position that the open position is effective and that after the opening action when the actuator starts the “Timing Operation” function.

The Timing Operation’s timing diagram is as follows:

关闭控制信号: **Closing control signal** 打开控制信号: **Opening control signal**

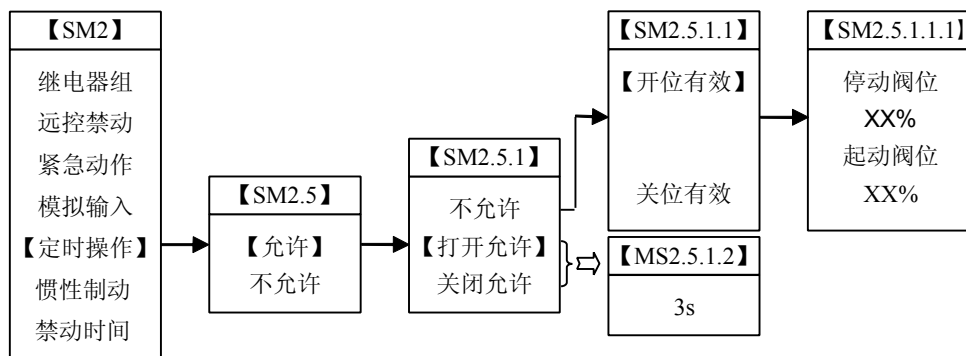
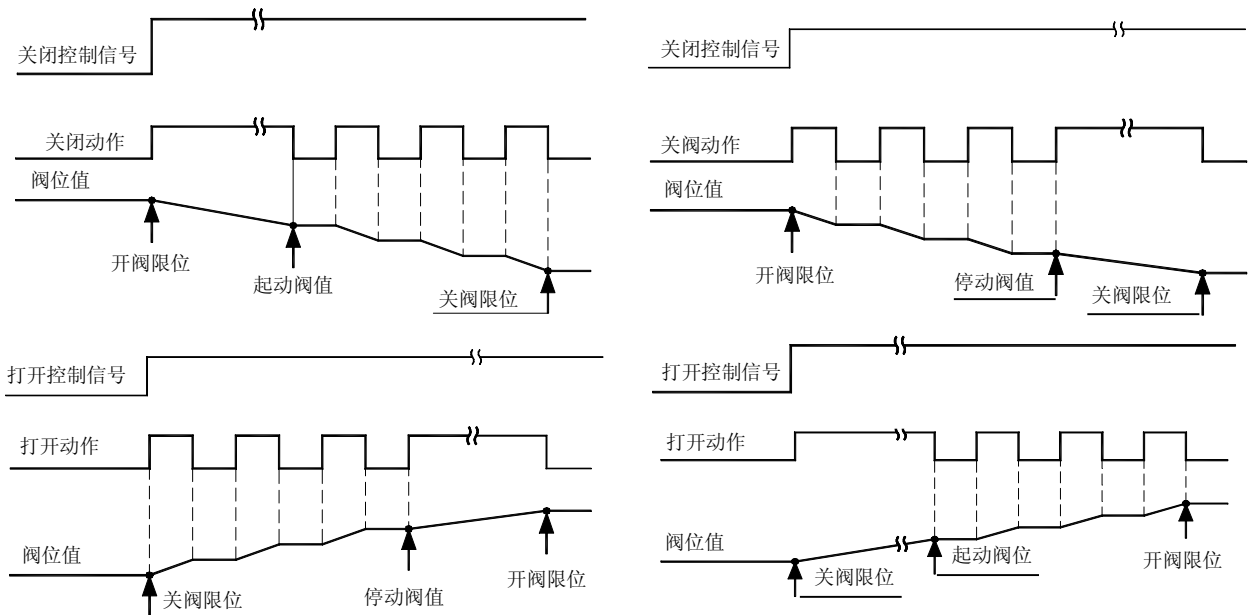
关闭动作: **Closing action**

打开动作: **Opening action**

阀位值: **Valve position value**

开阀限位: **Limit Open**

关阀限位: **Limit Closed**

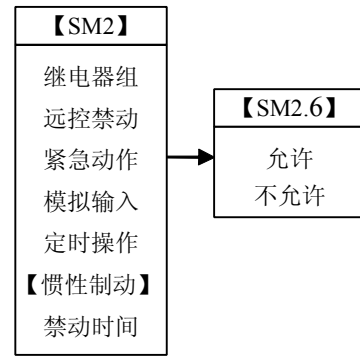


11.7.6 Inertia Trig [惯性制动]

The inertia trig is used to give an reverse energy to the motor and make the motor stop quickly so that we can obtain an accurate valve position control.

In the “SM2” menu, select the “**Inertia Trig**” [惯性制动] item and enter into the “SM2.6” menu, use “↓” and “↵” key to select the **Allowed**[允许] or **Not Allowed**[不允许] item. Because of affecting the motor and screw stem this function is not used commandingly.

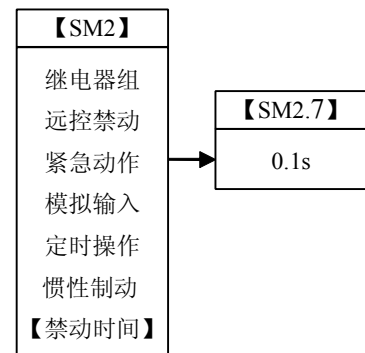
Notice : HKC range actuator has no “Inertia Trig” function.



11.7.7 Inactive Time [禁动时间]

The Inactive Time is the interim time of the actuator between the two consecutive actions, its value is 0.1s~9.9s. Because of overriding the prescriptive startup frequency is not allowed (HKC range startup frequency is 60 times per one hour, HKM range is 1200 times per one hour), in order to ensure this frequency we should configure the “Inactive Time” properly.

In the “SM2” menu, use “↓” and “↵” key to select the **Inactive Time**[禁动时间] item, depress the “↵” key and enter into the “SM2.7” menu. Use “+” or “-” key to select the required inactive time and depress “↵” key.

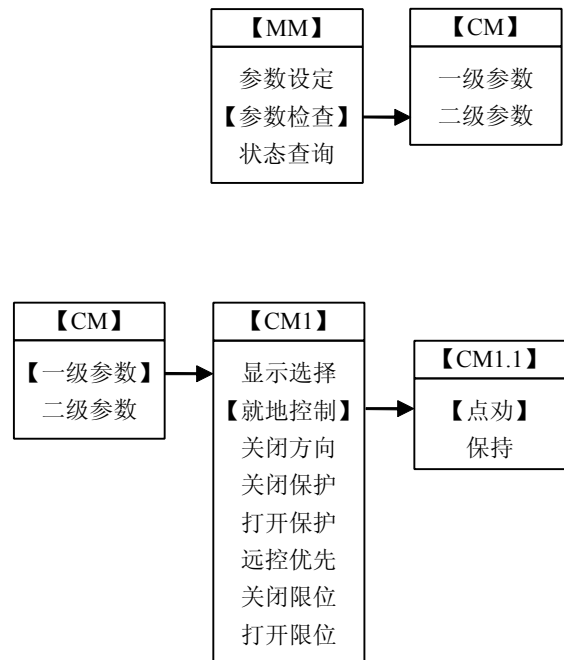


11.8 Parameters Checking [参数检查]

This function is used to check the configured work parameters.

In the “MM” menu, use “↓” key to select the “**参数检查**”[**Parameters Checking**] item, depress the “↵” key and enter into “CM” menu. “Parameters Checking” menu is the same as the “**参数设定**”[**Parameters Setting**]. Enter into the corresponding checking menu, if the Parameters Setting value is a numerical value then display the current setting value; if the Parameters Setting value is an option then the selected option will be display with the black bottom and white word in the corresponding menu.

e.g. Checking the setting value of the local control:



In the “CM1” menu, use “↓” key to select the “**就地控制**”[**Local Control**] item. depress “↵” key and enter into the “CM1.1” menu. Observing this menu, if the “**点动**”[**Push to Run**] is displayed with black bottom and white word that means the current value of the “**就地控制**” item is “**保持**”[**Push to Run**]. If the “**保持**”[**Maintained**] string is displayed with black bottom and white word that means the current value of the “**就地**

控制” item is “保持”. The other items are similar to this.



11.9 Status Interrogating [状态查询]

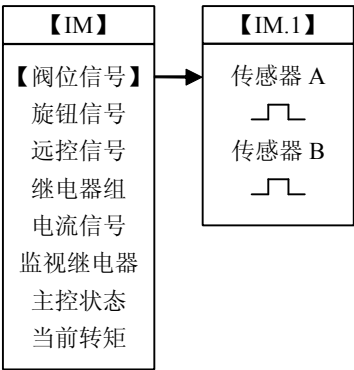
This function is used to interrogate the working circumstances of the actuator. If the working status is not natural, we can find the failure’s position quickly by this function.

In the “MM” menu, use “ ↓ ” key to select the “[状态查询]” item. depress “↵” key and enter into the “IM” menu.

11.9.1 Valve Position Signal [阀位信号]

You can know the working status about the valve position’s count value.

In the “IM” menu, use “ ↓ ” key to select the “[阀位信号]” item. depress the “↵” key and enter into the “IM.1” menu. In the “IM.1” menu, the signals of the valve position sensor A and B are displayed. At this time you can let the output shaft of the actuator turn by the local electric operation or hand operation. When the sensor energized a square wave “” is displayed, or else there’s spacing, with the turning of the actuator’s output shaft and if the valve position sensor A and B natural, the “IM.1” menu should be displayed and the square wave “” should be flashing. By this interrogating, we can know that the correlative parts of the valve position board and the main control board are natural or not.



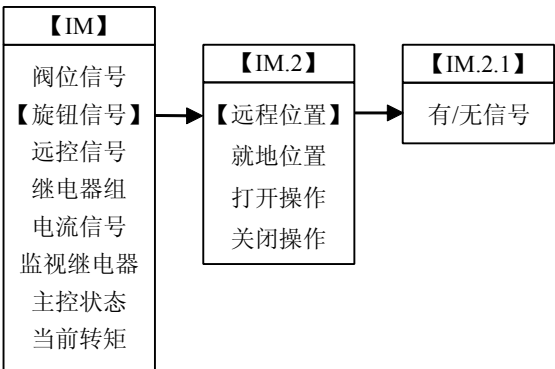
11.9.2 Switch Signal [旋钮信号]

By this we can know that the switch board and the junctures are natural or not. Use “ ↓ ” key to select the “Switch Signal” item. depress “↵” key and enter into the “IM.2” menu. Use “ ↓ ” key to select the required Option, depress “↵” key and enter into “IM2.1” menu. In the “IM2.1” menu you can see the results.

Remote Position[远程位置] ----- When the Mode Switch is in the “Remote Position”, the “是” string should be displayed , or else the “否” is displayed , when you use this operation you should close all remote signal or else the actuator may run .

Local Position [就地位置]----- When the Mode Switch in the “Local Position” , should display “是” or else display “否” .

When excuting the following items , if you don’t want that the actuator runs , you should let the mode switch in the “Stop” position .



Opening Operation[打开操作] ----- Operation Switch (black switch) is in the “Opening position” , should display “是” , or else display “否” .

Closing Operation [关闭操作]----- Operation Switch is in the “Closing” position , should display “是” , or else display “否” .

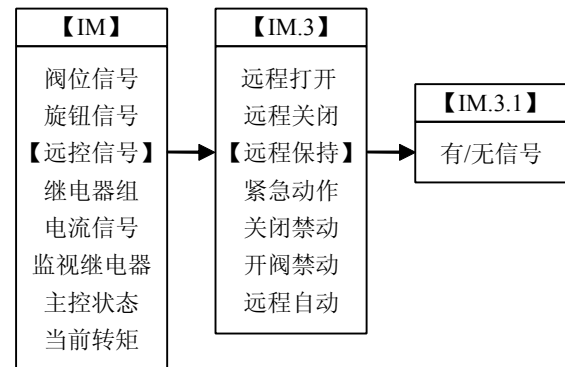
11.9.3 Remote Control Signal [远控信号]

By this , we can know that the correlative parts of the remote control board and the main control board are natural or not .

Before this operation , should let the Mode Switch locate in the “Local Position” or “Stop Position” .

In the “IM” menu , use “↓” key to select the “远控信号”[Remote Control Signal] item , then depress “←” key and enter into “MI.3” menu . Firstly explain the following

items (following are all the voltage of the actuator’s sunflower function box) :



“远程打开”[Remote Opening] ----- when the remote opening signal is high level should display “是”[Yes] , or else display “否”[No] .

“远程关闭”[Remote Closing] ----- when the remote closing signal is high level , should display “是” , or else display “否” .

“远程保持”[Remote Maintained] ----- when the remote maintained signal is high level , should display “是” , or else display “否” .

“紧急动作”[ESD] ----- when the ESD takes high level as effective value and the ESD signal is high level , should display “是” ; when the ESD takes the low level as effective value and the ESD signal is low level , should display “是” , or else is “否” .

“开阀禁动”[Opening Inactive] ----- when the “Opening Inactive” signal is low level , should display “是” , or else “否” .

“关阀禁动”[Closing Inactive] ----- when the “Closing Inactive” signal is low level , should display “是” , or else “否” .

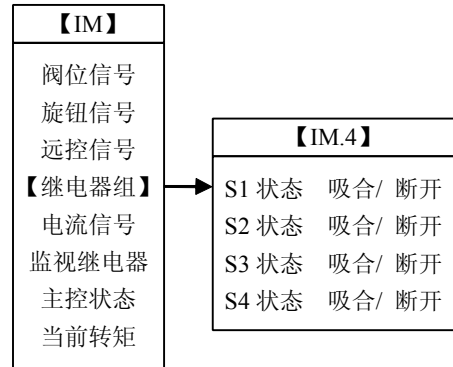
“远程自动”[Remote Automatic] ----- when the “Remote Automatic” signal is high level , should display “是” , or else “否” .

In the “IM.3” menu use “↓” key to select the required item , depress “←” key and enter into the “IM.3.1” menu , display this signal as “是” or “否” signal . Depress “↖” key and return back to “IM.3” menu .

11.9.4 Relay Group [继电器组]

The Relay Group is the four relays that used to indicate the current status of the actuator . You can interrogate that the four relays' status is open or closed . Select this item , these four relays' status will be display on the right side of the LCD screen .

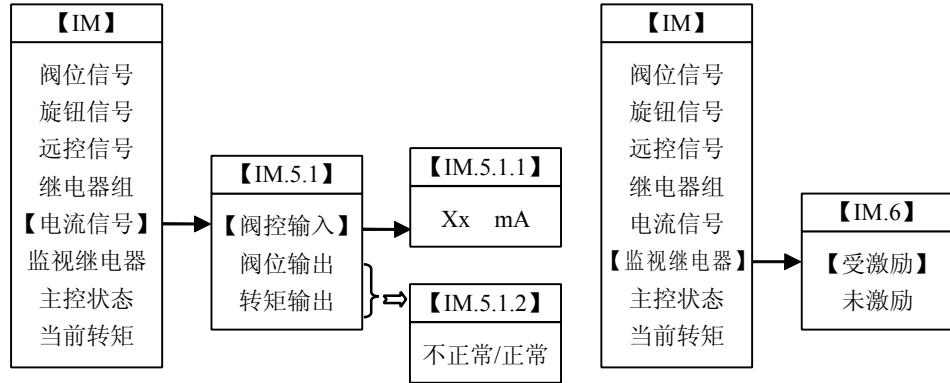
By this you can know that the relays of the remote control board are natural or not .



11.9.5 Electrical Current Signal [电流信号]

By this we can know that the correlative parts of the analog board and main control board are natural or not .

When you select “ 阀 控 输 入 ”[**Valve Control Input**] item , the



actual input value of the valve position electrical current will be display on the LCD screen . When you select the “ 阀位输出 ”[**Valve Position Output**] or “ 转矩输出 ”[**Torque Output**] item , the two items' status will be displayed on the LCD screen . **Notice :**

- ① **When using this function you will stop the motor . You can let the Mode Switch Locate in the “ Stop Position” or “Local Position” .**
- ② **The Valve Position output and the torque are all that the 4mA ~ 20mA electrical current output corresponds to the percent 0~100% . The two items are optional , please avow when ordering goods .**
- ③ **When you interrogate the “ 阀位输出 ”[Value Position Output] or “ 转矩输出 ”[Torque Output] , the intrinsic output value will be changed temporarily . But if you exit from this item's interrogation and make the output shaft running , the two output values will be recovered .**

11.9.6 Monitoring Relay [监视继电器]

This function is used to monitor the status of the actuator . In the natural circumstances this relay is energized . When one of the following instances appears , this relay will be not energized .

- ① One or more phase loss
- ② The internal of the system failed .
- ③ The Mode Switch is not in the “Remote Position” .

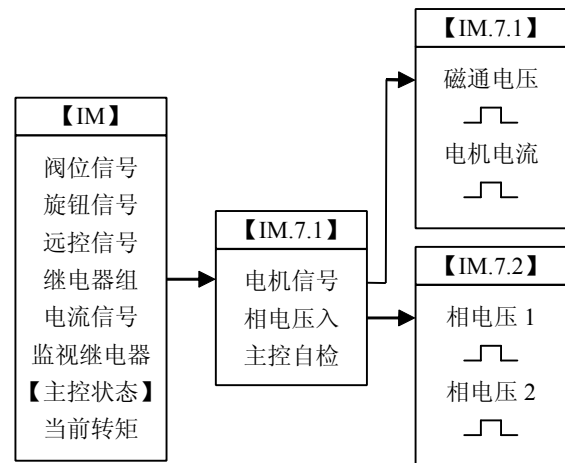
④ The motor is over temperature .

Use “↓”, “←” key to select the “监视继电器”[**Monitoring Relay**] item , enter into the “MI.6” menu and display “受激励”[**Energized**] or “未激励”[**De-energized**] automatically .

11.9.7 Main Control Status [主控状态]

By this function you can know the status of the main control board .

When select “电机信号”[**Motor Signal**] , enter into the “IM7.1” menu , at this time you can operate the actuator with the electric operation by the local mode and make the motor run . The magnetic-flux voltage and motor current signals’ flickering square wave will be displayed on the LCD screen .If there’s no square wave that means there’s no signal .When select “相电压入”[**Phase Voltage Input**] , enter into the “IM7.2” menu ,



at this time the flickering square wave will be displayed on the LCD screen without turning the motor , this means there’s signal . If no square wave that means there is no signal .

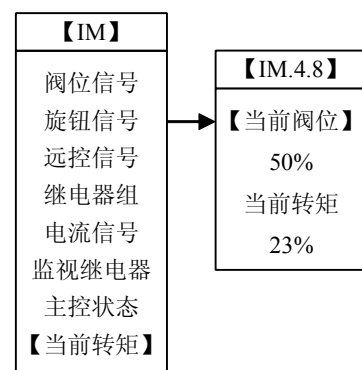
“磁通电压”:**Magnetic-flux Voltage**; “电机电流”:**Motor electrical current**

When select “主控自检”[**Main Control Selfchecking**], the actuator will be selfchecking and the results of the selfcheck will be displayed on the LCD screen, then the initial menu appears.

11.9.8 Current Torque [当前转矩]

By this function we can know the current torque value when the actuator is running.

Select the “当前转矩”[**Current Torque**], enter into the “IM4.8” menu. The percentage of the current torque and rated torque is displayed and the current valve position open percentage is also displayed with little numeric.



12. Display of the Alarm Signal

When the actuator is running, the corresponding alarm signal will be displayed in the alarm area of the LCD screen and it also will give indication to users:

(1) “开阀过矩”[**Torque Trip Open**]: when the actuator is opening, if the torque overrides the configured value, the actuator will stop.

(2) “关阀过矩”[**Torque Trip Close**]: when the actuator is closing, if the torque overrides the configured value, the actuator will stop.

(3) “缺相”[**Lose Phase**]: when the actuator is running, if the power supply loses phase, the actuator will stop.

(4) “电机过热”[**Over Temperature**]: when the temperature of the motor is over, the actuator will stop.

(5) “打开禁动”[**Opening Inactive**]: If the “远控禁动”[**Remote Control Inactive**] is configured as “允许”[**Allowed**] and the “Opening Inactive” signal is effective, when you execute the operation of the opening, the actuator will not run and this signal will be displayed.

(6) “关闭禁动”[**Closing Inactive**]: If the “远控禁动”[**Remote Control Inactive**] is configured as “允许”[**Allowed**] and the “Closing Inactive” signal is effective, when you execute the operation of the closing, the actuator will not run and this signal will be display.

(7) “电机失速”[**Motor Stalled**]: When the actuator is running, if the actuator can't detect the valve position's count value in five minutes, it will stop.

(8) “紧急关闭”[**Emergent Closing**]: If the ESD is configured as “允许”[**Allowed**] and the ESD signal is effective, the actuator will be closed.

(9) “紧急打开”[**Emergent Opening**]: If the ESD is configured as “允许”[**Allowed**] and the ESD signal is effective, the actuator will be open.

(10) “紧急有效”[**Emergent Effective**] : When the ESD is configured as “Allowed” and the ESD signal is effective, if the actuator has executed the “ESD” operation, at this time, if you want to make the actuator open or close but the ESD signal is still effective, the actuator will not run and this alarm signal will be displayed.

(11) “电源掉电”[**Power Failed**]: When the main power failed, this alarm sign will be displayed.

(12) “方向错误”[**Direction Errors**]: When you is configured the open limit in the primary settings, if the actuator's running direction is wrong, this alarm sign will be displayed.

(13) “计数上溢”[**Count Overflow**]: When the actual valve position count value is more than the allowed maximum, this alarm sign will be displayed.

(14) “阀位下溢”[**Valve Position Underflow**]: When the actual valve position count value is less than the allowed minimum, this alarm sign will be displayed.

(15) “阀位上溢”[**Valve Position Overflow**]: When the actual valve position count value is more than the allowed difference of the limit open, this alarm sign will be displayed.

If the overflow or underflow signal appears, means that the valve position count value is wrong, should set the limit open and limit closed over again.

(16) “内存有错”[**Memory Wrong**] : this means that when the actuator is running the RAM occurs error. This error has two instances:One is stochastic disturb, this is only required that resetting the actuator and setting the limit value again. The other is that the RAM is damaged, at this time you must change the main control board. By the “主控自检”[**Main Control Selfchecking**] item you can know that the RAM is natural or not. If not natural that means the RAM is damaged, or else this alarm signal is a stochastic disturb.

(17) “阀位有错”[**Valve Position Wrong**] :When the actuator is running, if the valve position count

value is wrong, this is ascribed to the remote control board, main control board or stochastic disturb.

Ensure the actuator's secure running. HKC/HKM range must use the lubricating agent in the table, or else can not ensure the dependability of the actuator. The temperature range of the environment is $-22^{\circ}\text{F}/-30^{\circ}\text{C} \sim -160^{\circ}\text{F}/+70^{\circ}\text{C}$. In the extreme climate there's special prescript.

Movement Viscosity is 100°C , flash point is 150°C at least, solidifying point is not more than -45°C .

13. Machine Maintenance:



If your actuator has run for six months, you must tighten the installation bolts.


Every actuator has been fully tested before leaving the factory to give years of trouble free operation, providing it is correctly commissioned, installed and sealed.

If your actuator can not be installed immediately store it in a dry place until you are ready to connect incoming cables.

Don't pull out the transit cable entry plugs until you are ready to connect incoming cables.

14. Changing Battery:

When the battery's sign is “”, that means the battery is low, you should change the battery quickly. If the battery's sign is “”, that means the battery is exhausted, must change the battery quickly. Please change the battery when the main power is on. Before changing you must let the Mode Switch locate in the “stop” position, after your changing you will let the Mode Switch locate in the primary position.

Notice : If the battery's sign is “” and the main power is failing, we do not ensure the correctness of the valve position after you changing the battery. In this circumstances, you should notice that the valve position after changing battery is the same as the one before changing battery. If not the same, you should set the limit closed and the limit open again.

15. Important Notices

1). In order to ensure that the torque protection value of the close/open direction is rational, you must make the Mode Switch locate in the local position, let the medium flow pass by the valve and let the actuator run backwards and forwards in the open and close direction empty times. At the same time, you should adjust the torque protection value in order to ensure that there's no over, torque in the midway.

2). In the following three instances, you must check that the limit open and limit closed values are correct or not.

(a) Changing the battery while the main power failed.

(b) Main power failed, the battery is exhausted naturally and no display is on the LCD screen.

(c) The following alarms occur when running:

Motor stalled (without other exceptional instance, may reset it with the Setting tool).

RAM Errors (May reset it with the Setting Tool)

Valve Position Overflow

Valve Position Underflow

Chapter two HK range intelligent electrical actuator selection, installation and debugging instructions

1. Advanced design

The HK range Electrical actuators offers many specially performances, high cost-effective even its applies in the general situation.

Non-intrusive switching:

The HK range Electrical actuators utilizes magnetic induction mode switching without any shafts penetrating the shell.

Non-intrusive setting:

The actuators operational parameter setting are effected using the non-intrusively, hand held, infra-red setting tool.

Double sealed:

All the HK series actuators are housed in a double-sealed enclosure and prov complete protection to the internal equipment even if the terminal cover are remov during site wiring, the type of waterproof actuator can running 48 hours while the actua immerge into water deep 3 meters.

Torque protection:

A sensor serve as overload protection for the entire valve travel, and you can setu different torque volume between 40~120% of rated torque, in addition the open torc protection value can be different from close torque.

Limit protection setting:

If this function is enable, the actuator shall be stopped automatically while the valve position reaches the limit position.

Loss Phase protection:

The actuators real time monitor all three phase of the power supply during operation to prevent the motor from running when the power supply is short of phase.

Electronic Latching :

Electronic Latching inhibits the actuator torque protection function within 5 seconds and allows the motor to generate torque in excess of rated torque to enable operation of jammed valves while starting operation signal is enable , should the actuator stall when attempting to unseat a valve stuck in its seat, the motor will be de-energised to prevent damage.

Motor thermal protection:

Two thermostats are embedded in the windings for provide thermal-protection by de-energise motor in the event of motor over the maximum temperature.

Electric protection:

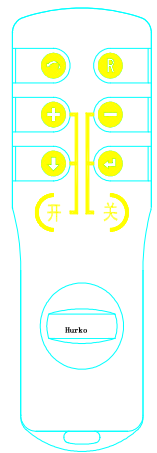
The input and output signal channel of circuits are designed as photoelectric isolate mode.

Valve position and torque measure:

Use hall effect magnetic pulse system continually monitoring the valve position and use the magnetic flux and current of the motor for continually measures the controlling torque are to avoid the mechanical wearing and ensure function stability.

Automatic correction for phase sequence:

The actuators monitor the phases and run in the correct direction regardless of the sequence of power supply connection that is realized through a phase rotation correction Boolean logical calculation .



Setting the following configurations with infra-red setting tool

- ✧ Direction to close
- ✧ Close limit position protection function
- ✧ Close/ open operation torque value
- ✧ Open /close limit position
- ✧ ESD Optional function (ESD: Emergency shut down)

Digital indication of valve position:

The percentage digital of valve position real time indicates on LCD display.

Power failed protection:

If main power failed, the internal battery of the actuator should supply power for control circuit and supports valve position control in hand operation. In case of no battery available, actuator can save the currently valve position Data as well.

Handwheel operation:

Direct drive handwheel to provide reliable emergency manual operation in the event of a power supply failure. Electric operation always has the higher priority than manual operation, when motor is energized that the operation state automatic switch to electric operation mode unless hand/auto lever is purposely locked into 'manual operation'

Explosion proof:

The actuators has high class enclosure which is designed according to GB3836, it provides reliable ingress and seals guarantee. In addition, the threaded is designed at the cable entry conduit of the actuator for fixing explosion proof tube.

High torque, low inertia motor:

The low inertia and high torque motor generates peak torque rapidly after starting but with very little overrun when it is de-energized.

Lubrication:

HK series are filled with high-quality gear oil, the most important machine parts such as worm and turbine operates in an oil bath to reduce wearing and extend life.

Standard valve/actuator interface:

Actuator Base of ranges HK03 to HK60, designed as a removable mode and range HK100 to HK300 as an integral mode, the flange and drive bushing conforming to international standard ISO5210

Thrust bearing configuration:

The type 'A' is the thrust type drive bushing that couples a fully sealed and lubricated thrust bearing to guarantee which have not any load effects on the actuator inner structure.

Solid state circuit measure:

All of range HK provides the solid state circuit to measure the torque without any mechanical equipments such as the spring switch or the level.

1.1 Specification:

Power Supply:	380VAC/50Hz	220VAC/50Hz
Watertight Enclosure :	IP68	
Explosion Proof:	Exd II CT4	
Ambient Temperature:	-40~+70C°	
Ambient Humidity:	≤95%	

Frequency of Operation: To the on-off mode is 60 starts per hour; the modulatory mode is 600 starts

per hour. All series HK actuators are maximal continuous operation time within 15 minutes per hour.

2 . Applications

2.1 Multi-turn control:

range HK on-off mode multi-turn actuators suitable the required that within 60 starts per hour, maximal continuous operation time within 15 minutes and duty cycle under 33%. The range HK has also modulatory mode actuator(the frequency of operation is under 600 starts per hour) . range HK on-off mode actuator combined with B,S, or D gear box could control the largest gate valve, globe valve and the reduction ratio as 4:1, 6:1, 10:1, 40:1, 60:1, 70:1 and listed go on. In this case, we can get the largest output torque.

Rated Output Torque: 34Nm ~ 3000Nm;

Output speed: 18 / 24 / 36 / 48 / 72 / 96 / 144 / 192 rpm;

range HK on-off mode actuators provide 'B' type drive bushing for output rotate operation and 'A' for Linear operation.

2.2 Linear control:

range HK on-off mode actuator combined with X series components could directly control linear operation valve such as slide valves.

2.3 0~90° travel control:

range HK on-off mode actuator combined with W gear box could carry out valve's quarter turn operation, the reduction ratio as 40:1, 60:1, 70:1 and list go on, in this case, we can get a largest output torque.

3. Technical Data

3.1 range HK or HKC actuator performance (220VAC / 50Hz)

Output rotate speed (rpm)		18	24	36	48	72	96	144	192
HK03 HKC03	Rated output torque N. m	20	17	17	15				
	Motor power KW	0.08	0.08	0.08	0.08				
	Start current A	7.3	7.3	7.3	7.3				
	Rated current A	1.8	1.8	1.8	1.8				
HK08 HKC08	Rated output torque N. m	24	23	20	17				
	Motor power KW	0.1	0.1	0.1	0.1				
	Start current A	7.9	7.9	7.9	7.9				
	Rated current A	1.9	1.9	1.9	1.9				
HK14 HKC14	Rated output torque N. m	30	25	22					
	Motor power KW	0.12	0.12	0.12					
	Start current A	8.5	8.5	8.5					
	Rated current A	2	2	2					
HK20 HKC20	Rated output torque N. m	81	81	81	63	63			
	Motor power KW	0.23	0.25	0.28	0.28	0.32			
	Start current A	11.6	13	14.1	14.1	16.5			
	Rated current A	2.8	3.2	3.4	3.4	3.6			
HK40 HKC40	Rated output torque N. m	142	142	127	108				
	Motor power KW	0.35	0.37	0.37	0.35				
	Start current A	17.2	18.1	18.1	17.2				
	Rated current A	3.75	3.9	3.9	3.75				
HK60 HKC60	Rated output torque N. m	272	252	204	157	109			
	Motor power KW	0.8	0.8	0.75	0.8	0.8			
	Start current A	36	36	32	36	36			
	Rated current A	7.8	7.8	7	7.8	7.8			

3.2 range HK or HKC actuator performance (380VAC/50Hz)

Output rotate speed (rpm)		18	24	36	48	72	96	144	192
HK03 HKC03	Rated output torque N. m	34	34	34	34	34	34		
	Motor power KW	0.05	0.05	0.07	0.10	0.13	0.17		
	Stall current A	1.4	1.8	2.3	3	3.6	3.6		
	Rated current A	0.45	0.6	0.75	1	1	1.3		
HK08 HKC08	Rated output torque N. m	81	81	81	81	61	47		
	Motor power KW	0.12	0.14	0.19	0.23	0.24	0.24		
	Stall current A	2.7	3.7	4.7	6.4	6.4	6.4		
	Rated current A	0.85	1.1	1.5	2.1	2.1	2.1		
HK14 HKC14	Rated output torque N. m	108	136	102					
	Motor power KW	0.15	0.23	0.23					
	Stall current A	3.7	6.4	6.4					
	Rated current A	1.1	2.1	2.1					
HK20 HKC20	Rated output torque N. m	203	203	203	203	176	142	102*	
	Motor power KW	0.30	0.35	0.47	0.58	0.70	0.70	0.70	
	Stall current A	6.8	9.25	10.25	13.4	16	16	16	
	Rated current A	2.3	2.8	3.6	4.6	5.5	5.5	5.5	
HK30 HKC30	Rated output torque N. m	350	300	250					
	Motor power KW	0.55	0.55	0.5					
	Stall current A	12.5	12.5	13.4					
	Rated current A	4.3	4.3	4.6					
HK40 HKC40	Rated output torque N. m	400	400	298	244				
	Motor power KW	0.58	0.68	0.68	0.68				
	Stall current A	13.4	16	16	16				
	Rated current A	406	5.5	5.5	5.5				
HK60 HKC60	Rated output torque N. m	610	610	542	474	474	366	257	
	Motor power KW	0.90	1.05	1.27	1.35	1.90	1.80	1.80	
	Stall current A	18	25	28	29	41	37	37	
	Rated current A	6	7	9	8.2	12.5	12	12	
HK100 HKC100	Rated output torque N. m	1020	1020	845	680	680	542	406*	
	Motor power KW	2.10	2.10	2.10	3.7	3.7	3.7	3.7	
	Stall current A	45	45	45	61	61	61	61	
	Rated current A	11	11	11	16.5	16.5	16.5	16.5	
HK150 HKC150	Rated output torque N. m	1490	1490	1290	1020	1020	745	645*	542*
	Motor power KW	2.75	2.75	4.80	4.80	4.80	4.80	4.80	4.80
	Stall current A	61	61	95	95	95	95	95	95
	Rated current A	15	15	25	25	25	25	25	25
HK200 HKC200	Rated output torque N. m	2030	2030	1700	1355	1355	1020	865*	730*
	Motor power KW	4.5	4.5	4.5	7.5	7.5	7.5	7.5	7.5
	Stall current A	78	78	78	138	138	138	138	138
	Rated current A	21	21	21	35	35	35	35	35
HK201 HKC201	Rated output torque N. m							1355*	1355*
	Motor power KW							13.0	13.0
	Stall current A							218	218
	Rated current A							88	88
HK300 HKC300	Rated output torque N. m		3000						
	Motor power KW		4.8						
	Stall current A		78						
	Rated current A		22						

Note: If you want to use these type of range HK or HKC actuators that have a sign " * " in above data sheet to drive your valve directly, you must consider carefully.

3.3-4 Technical Data of worm Gearbox

Type	Ratio	input torque(N.M)	output torque(N.M)
D3	42:1	100	1050
D4	43:1	100	1075
D5	54:1	100	1350
		200	2700
D6	48:1	200	2400
		300	3600
		450	5400
		600	5400
D7	58:1	200	2900
		300	4350
		450	6525
		600	8700
		450	5960
D8	53:1	600	7850
		900	11925
		1200	15900
D9	63:1	450	7080
		600	9450
		900	14175
		1200	18900
D10	66:1	900	14850
		1200	19800
		1800	29700
		2500	41250
D11	81:1	900	18225
		1200	24300
		1800	36450
		2500	50625
D12	81:1	1800	36450
		2500	50625
		3500	70875
		5000	101250
D13	100:1	3500	87500
		5000	125000
D14	90:1	8000	200000

Note:1.The shown of tables"Technical Date Worm Gearboxes"just for partially of first reduction configurations of gearboxes,we also provided the secondary reduction configurations of gearboxes that Reduction Ratio over than 100:1,for more

detail information please contact to us.

- We can recommend model designation according to the valve technical Data of provided by customer such as diameter, pressure, differential pressure, type of valve, median flow rate etc.

3.5 Valve/Actuator interface

Model		HK03 HK08 HK14	HK20 HK30 HK40	HK60	HK100	HK150	HK200	HK201	HK300
Thrust Base (A)	Max. acceptance diameter Basset (mm)	32	51	67	73	83	83	—	83
	Max. acceptance diameter Hidden (mm)	26	38	51	57	73	73	—	73
Non- Thrust Base (B)	“B1” type (fixed bore)	42	60	80	—	—	—	—	—
	“B3” type (fixed bore)	20	30	40	50	50	50	50	—
	“B4” type (fixed bore)	20	30	44	50	60	60	60	—
Flange		F10	F14	F16	F25	F25	F30*	F25	F30
Weight (kg)		33	55	80	235	258	259	238	258

* In case of HK200 or HKC200 coupling with B3、B4, may choose flange of F25.

** The above table also adapts to the series HKC actuator.

3.6 Coupling dimension

3.6.1

Series HK Interface Matching Table

Actuator Type		HK03/HK08/ HK14	HK20/HK30/ HK40	HK60	HK100	HK150	HK200	HK201	HK300
Thrust Type A (mm)	Max acceptance diameter Basset	32	51	67	73	83	83	—	83
	Max acceptance diameter Hidden	26	38	51	57	73	73	—	73
Non- thrust Type B (mm)	“B1” type	42	60	80	—	—	—	—	—
	“B3” type	20	30	40	50	50	50	50	—
	“B4” type	20	30	44	50	60	60	60	—
Flange type		F10	F14	F16	F25	F25	F30*	F25	F30
Net weight kg		33	55	80	235	258	258	238	258

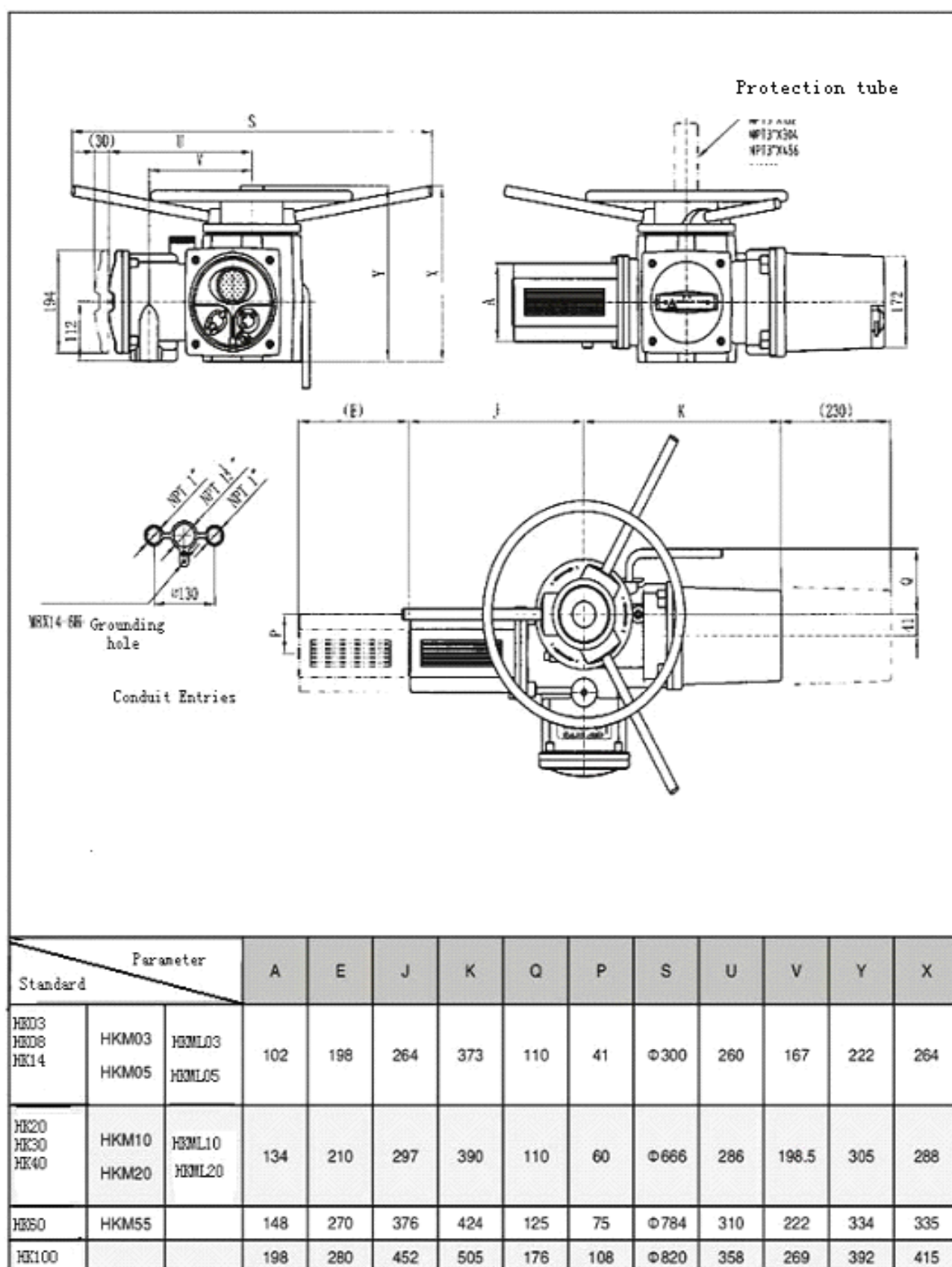
In case of HK 200 coupling with B3,B4, may choose flange of F25.

Attention: If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.2

HKD3-HK100 / HKM03-HKM55 / HKML03-HKML20

Actuator dimension data

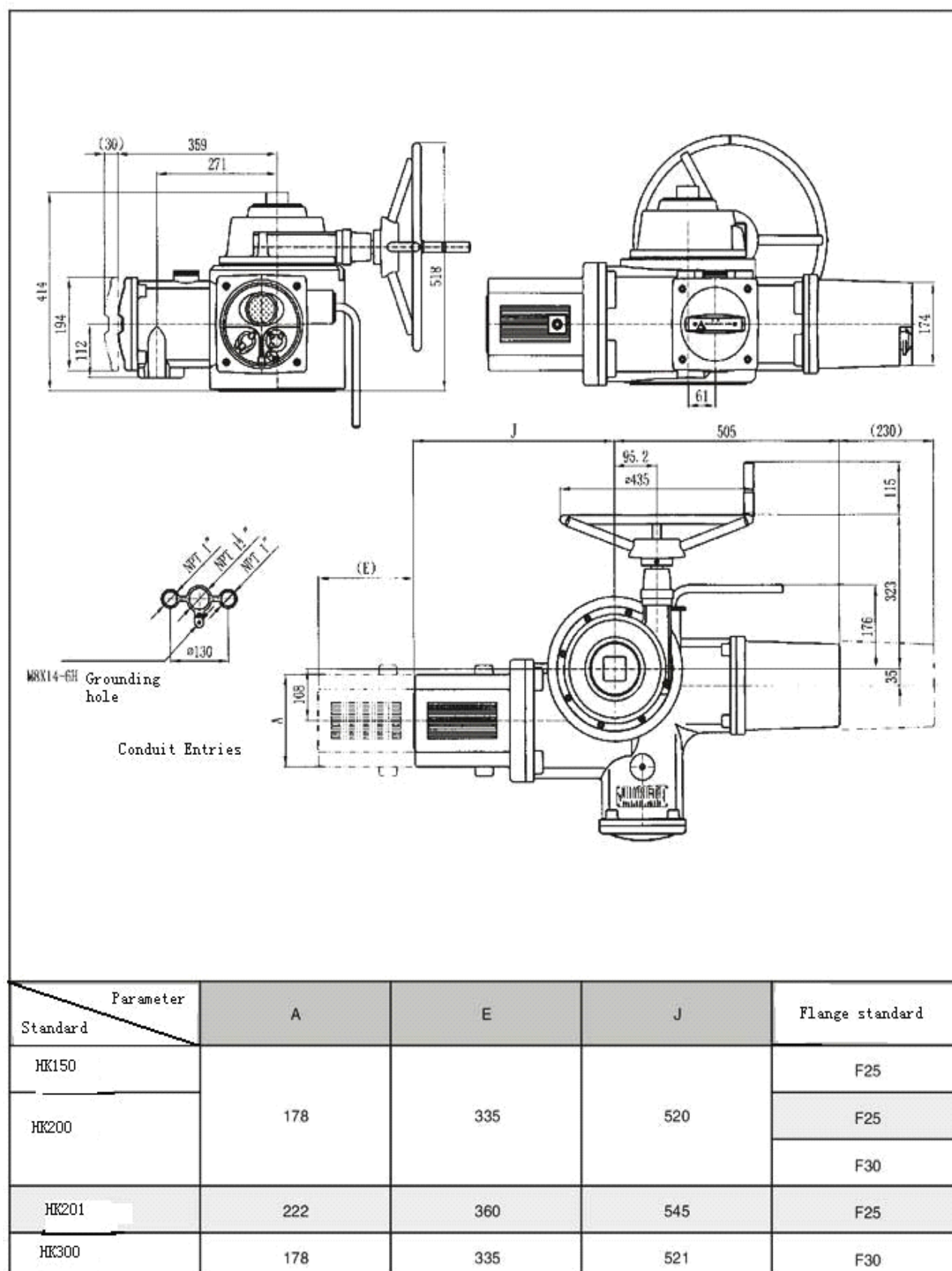


If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.3

HK150/HK200/HK201/HK300

Actuator dimension data

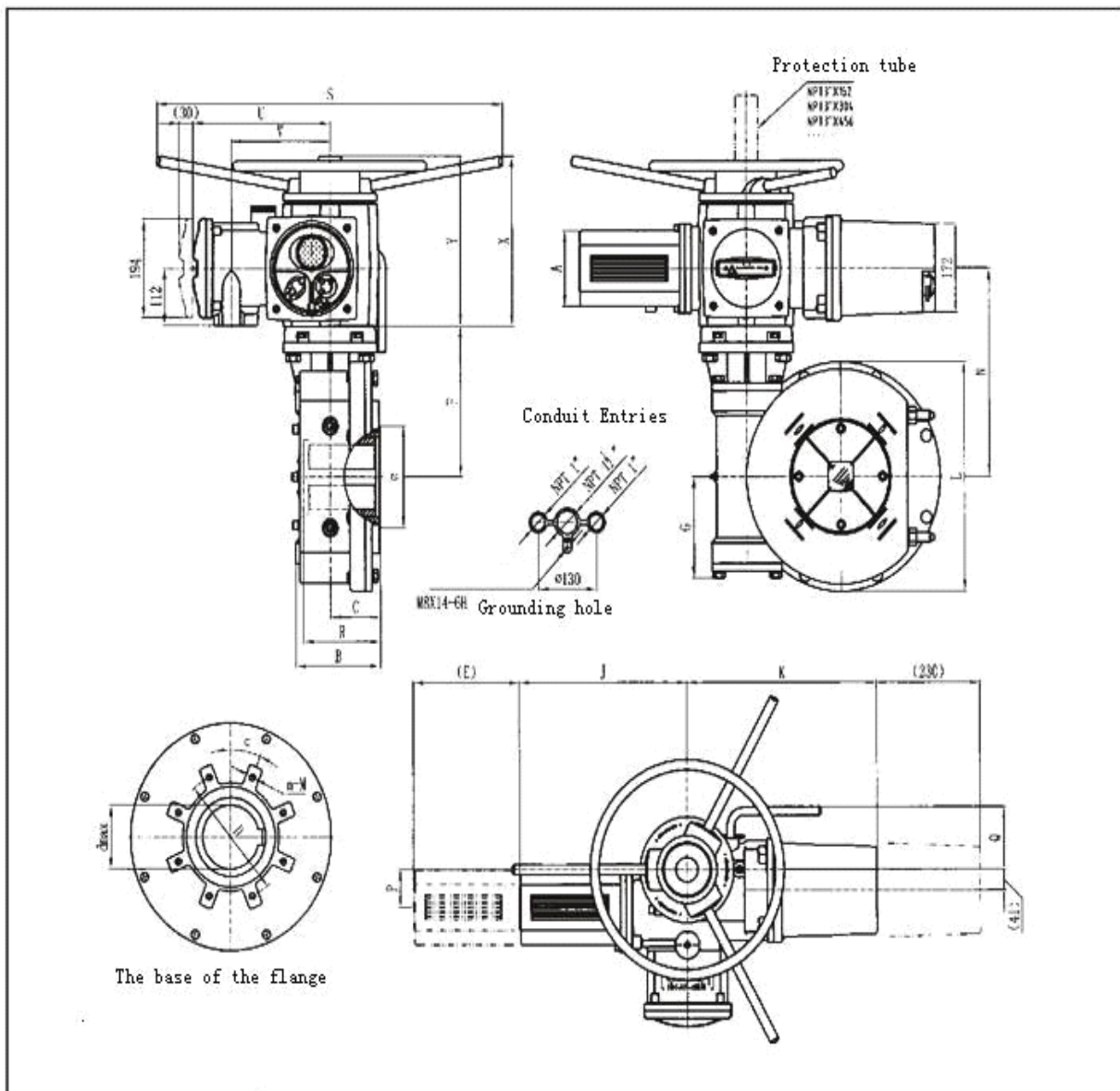


If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.4

HK -D / W HKM-W

Series HK actuator combined with D/W one grade gear box



Standard \ Parameter			A	E	E	J	K	Q	P	S	U	V	Y	X
HK03	-14/H4	HKM03-05/W4	102	198	198	264	373	110	41	φ 300	260	167	222	264
HK20	-40/H4	HKM10-20/W4	134	210	210	297	390	110	60	φ 666	286	198.5	305	288
HK20	-40/H5	HKM10-20/W5												
HK20	/H6	HKM10/W6												
HK20	/H7	HKM10/W7												
HK60	/H7	HKM55/W7	148	270	270	376	424	125	75	φ 785	310	222	334	335

Standard \ Parameter			dmax	D	B	α	C	R	n-M	F	H	G	L	N
HK03	-14/H4	HKM03-05/W4	φ 64	φ 140	106	45°	50	93	4-M16	147	101.6	108	φ 218	230
HK20	-40/H4	HKM10-20/W4			134		65	120	4-M20	197	135.89	134	φ 285	248
HK20	-40/H5	HKM10-20/W5			φ 76		φ 165	134	65	120	4-M20	197	135.89	134
HK20/H6		HKM10/W6	φ 102	φ 254	147	22.5°	70	130	8-M16	186	177.8	144	φ 375	303
HK20/H7		HKM10/W7	φ 127		181		87	160		276	209.55	196	φ 450	377
HK60/H7		HKM55/W7												289

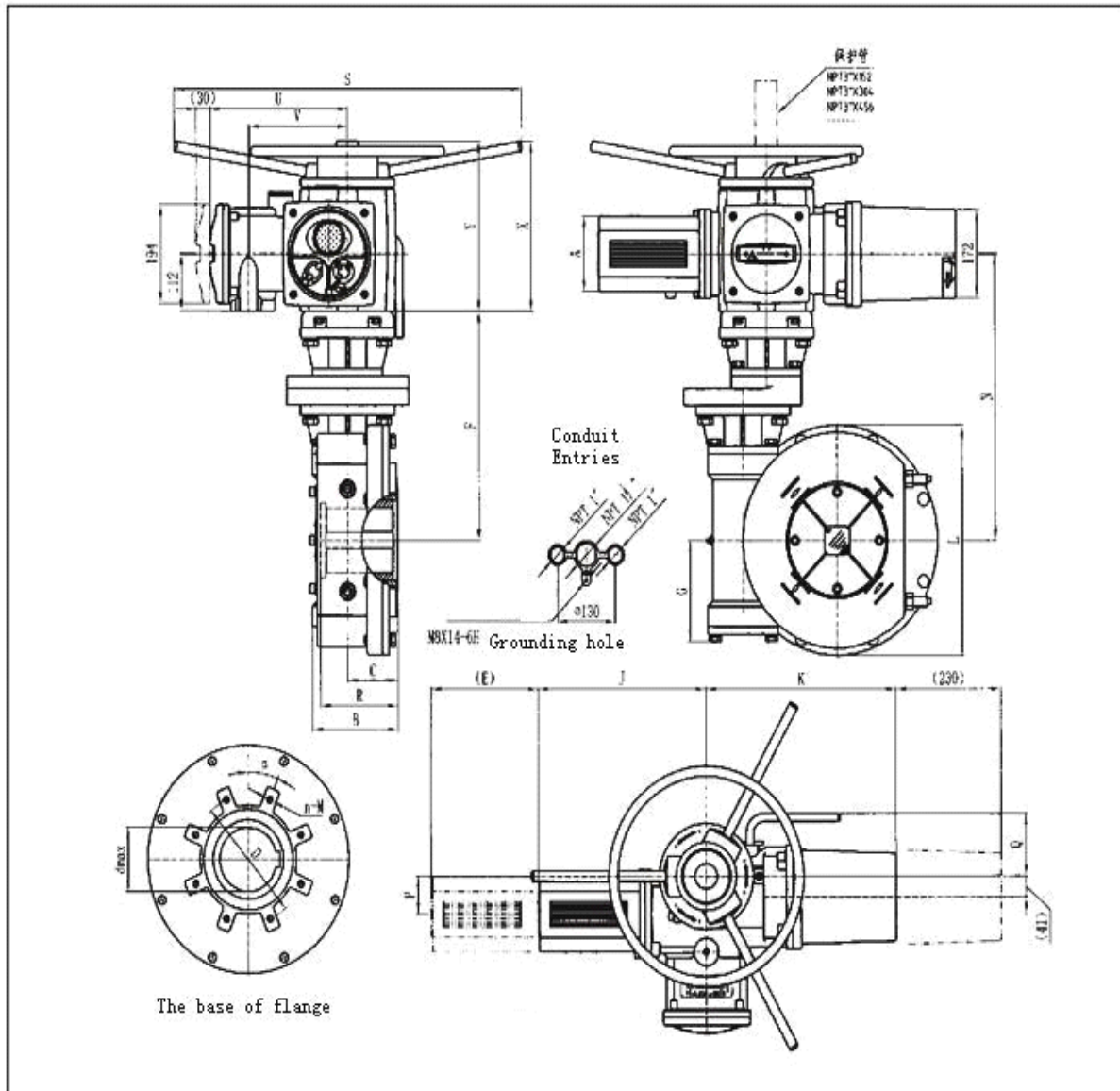
The character "H" includes series D or W gear-box in the above data table.

If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.5

HK- DR / WR HKM-WR

Series HK actuator combined with two grades gear-box



Parameter			A	E	J	K	Q	P	S	U	V	Y	X
Standard													
HK03	-14/H4R	HKM03-05/W4R	102	198	264	373	110	41	φ 300	260	167	222	264
HK20	-40/H5R	HKM10-20/W5R	134	210	297	390	110	60	φ 666	286	198.5	305	288
HK20	-40/H6R	HKM10-20/W6R											
HK20	-40/H7R	HKM10/W7R											
HK20	-40/H8R	HKM10/W8R											
HK60/H8R		HKM55/W8R	148	270	376	424	125	75	φ 785	310	222	334	335

Parameter			dmax	D	B	α	C	R	n-M	F	H	G	L	N					
Standard																			
HK03	-14/H4R	HKM03-05/W4R	φ 64	φ 140	106	45°	50	93	4-M16	274	101.6	108	φ 218	341					
HK20	-40/H5R	HKM10-20/W5R	φ 76	φ 165	134		65	120	4-M20	324	135.89	134	φ 285	425					
HK20	-40/H6R	HKM10-20/W6R	φ 102	φ 254	147	22.5°	70	130	8-M16		177.8	144	φ 375	425					
HK20	-40/H7R	HKM10/W7R	φ 127		181		87	160			209.55	196	φ 450	578					
HK20	-40/H7R	HKM10/W8R	φ 153		194		95				170			246.38	226	φ 520	597		
HK60	/H8R	HKM55/W8R															608		

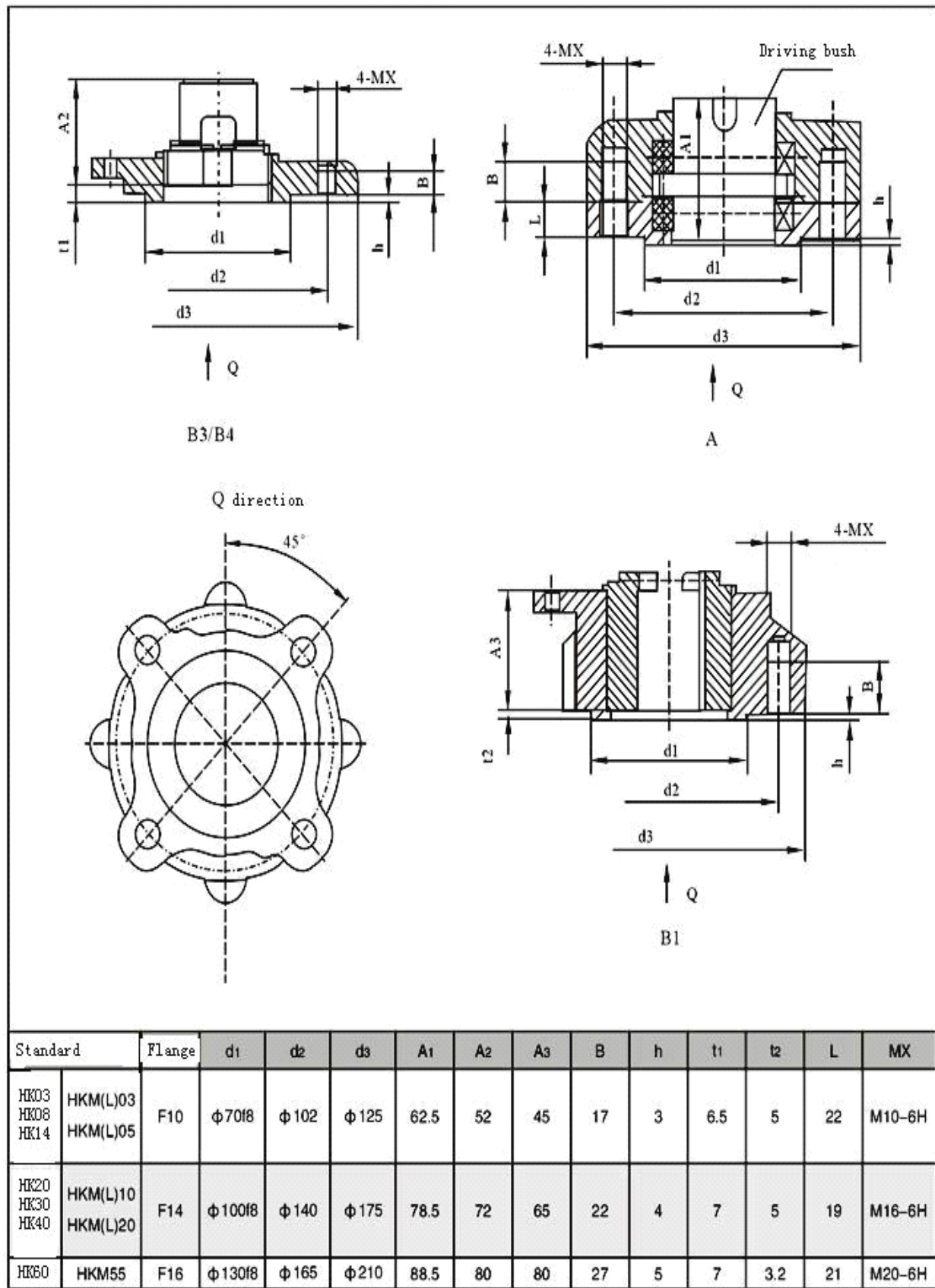
The above table is only the part, if you want to get more, please contact us!

If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.6

F10 / F14 / F16 Coupling flange

HK03-HK60 / HKM03-HKM55 / HKML03-HKML20

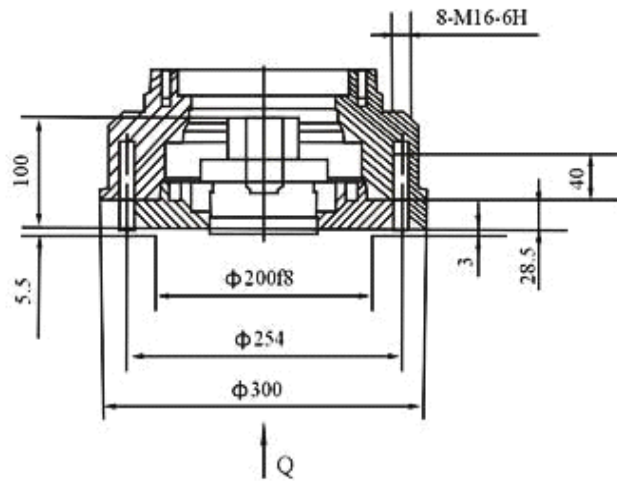
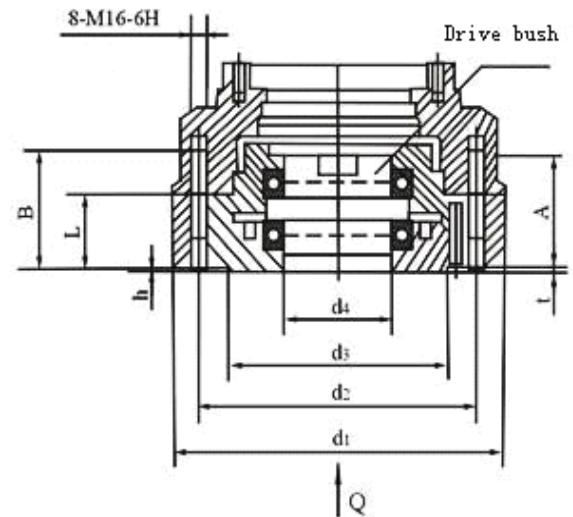
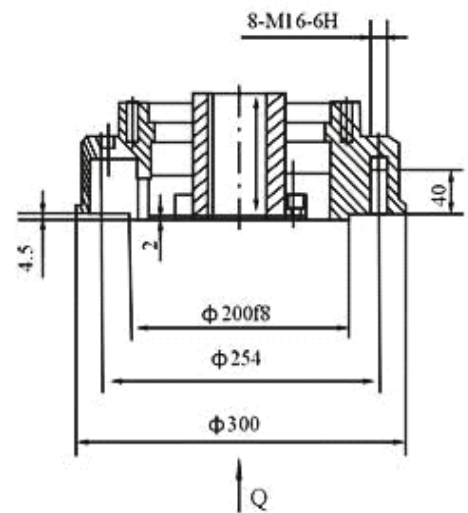
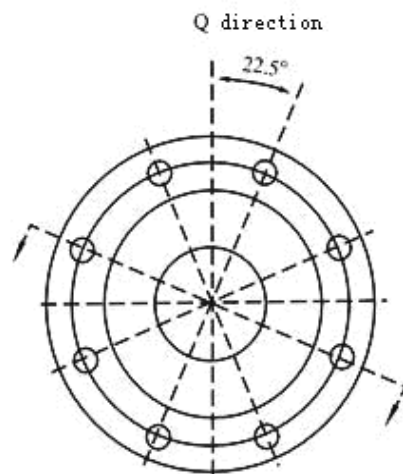


If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.7

F25 Flange

(HK100 / HK150 / HK200 / HK201)

F25 B3 / B4
(HK100)F25 A
(HK100, HK150, HK200)F25 B3 / B4
(HK150, HK200, HK201)

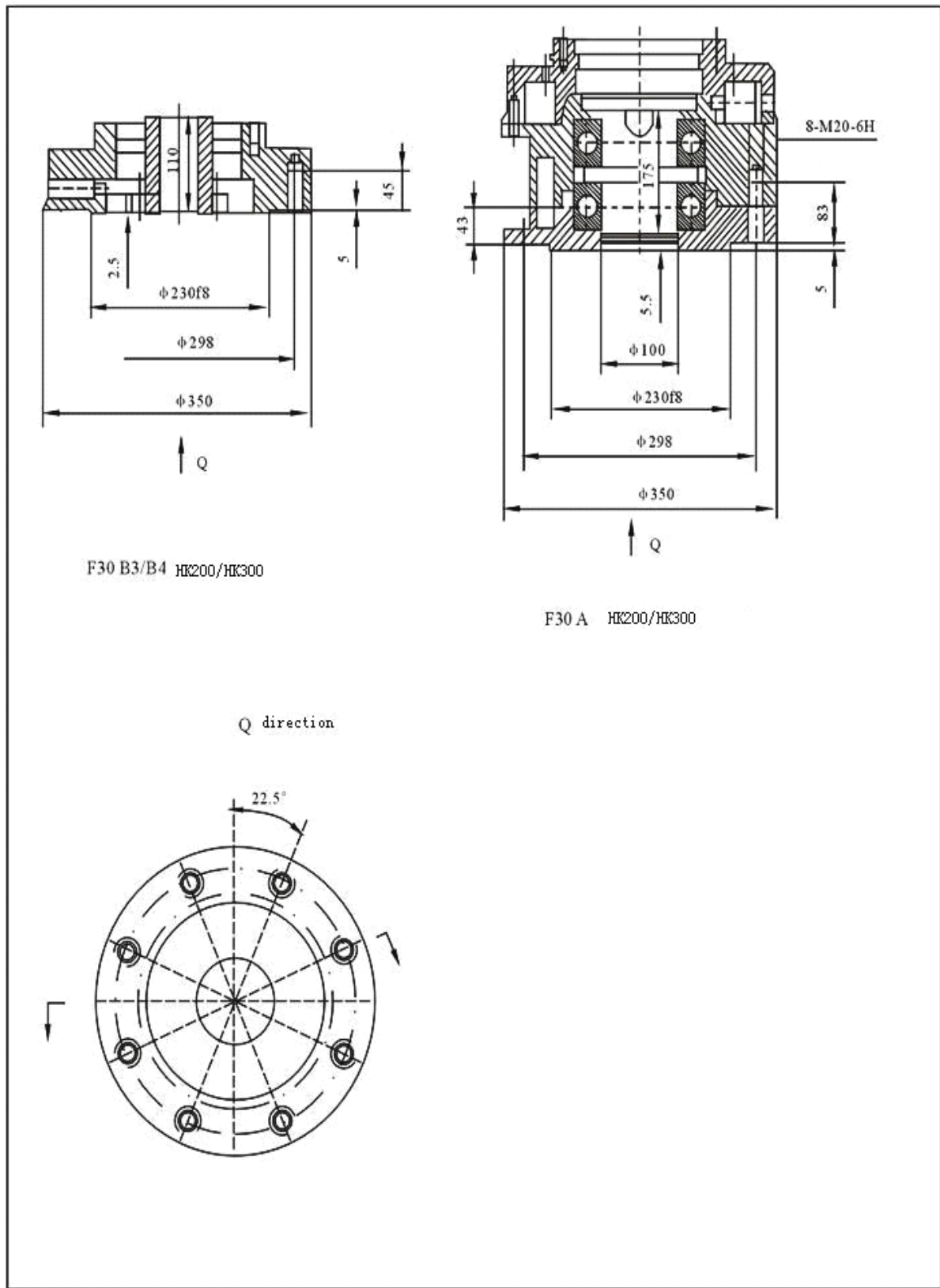
Type	Flange	d1	d2	d3	d4	A	B	L	h	t
HK100	F25	$\phi 200f8$	$\phi 254$	$\phi 300$	$\phi 100$	100	106.5	66.5	3	4.5
HK150					$\phi 110$	120	143	103	5	5.5
HK200										

If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

3.6.8

F30 Coupling flange

HK200/HK300



If you change the string "HK" to "HKC", the above table also adapts to the series HKC actuator.

***The shown just listed partially combination Datas, the more requested please contact us.**

4. Actuator electrical wiring diagram

Notice: all the numbers shown in the wiring diagram means the terminal port number.

4.1 range HK basic type (wiring diagram B)

range HK basic type may control motors rotary orientation without any external control relay (cabinet) and the ways of control include: Local control, remote control and ESD control. The wiring diagram of about remote controlling refer to figures from 1-1 to 1-9. This series actuators also provide single phase AC motor, terminal port 1 and 2 are power supply input with AC220V, port 3 is not used

Actuators wiring diagram refer to the right-side figures.

O1/C1 – normally opening contact; when the open/close limit position, the contact is closed.

O2/C2 – normally closing contact; when the open/close limit position, the contact is open.

QO/QC – normally closing contact; when open/close over torque, the contact is open.

Above relays contract rating 5A/250VAC or 5A/30VDC.

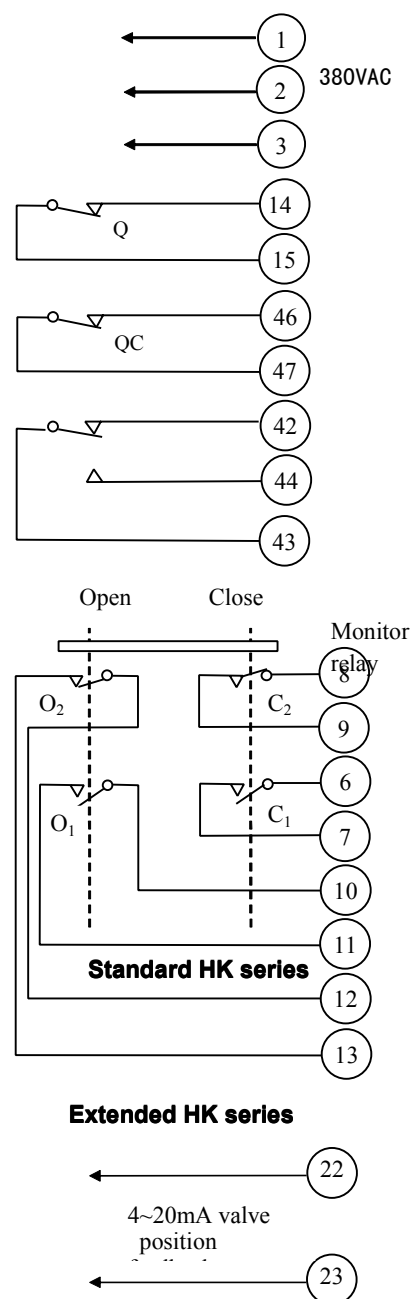
The monitor relay contract rating 5A/250VAC or 5A/30VDC. While monitor relay do not be at de-energized, terminal port 43 link with 42; while monitor relay is at energized, port 43 does not link with 42 but links with 44. In following cases relay should be at de-energized: Main power supply failed or phase lose; main control circuit failed; Local/remote selection knob at Local; thermostat tripped. All above that, monitoring the Local/remote control status by monitor relay is possible.

4.2. range HK extended type (wiring diagram is BI,BO,BIO)

The type of the extended series HK is added a 4~20mA feedback signal module and a 4~20mA valve position control signal module to the basic type range HK, its wiring diagram is divided into three kinds, first one is BI (add a 4~20mA valve position control signal module to the basic type range HK), second one is BO (add a 4~20mA feedback signal module to the basic type range HK), the third one is BIO (add a 4~20mA valve position control signal module and a 4~20mA feedback signal module to the basic type range HK)

This extended type range HK is 600 starts per hour as its operation frequency.

Notice: If have any special requirement orders please contract us.



4.3 Control and Wiring (also adapts to HKE series)

Please see the table "Terminals description sheet"

Terminals description sheet

No.	Name	Operation	No.	Name	Operation
\perp	Grounding	Wiring ground port	23	Valve position feedback- signal (-)*	Valve position current signal feedback port (-)
1	POW-VAC1**	380VAC Input port 1	25	ESD	Emergency shut down signal input port
2	POW-VAC2**	380VAC Input port 2	26	Valve-position control signal (+) *	Control current input +
3	POW-VAC3**	380VAC Input port 3	27	Valve-position control signal (-) *	Control current input -
4	DC 0V	DC 24V “-” output port	33	Remote close	Remote close signal input port
5	DC 24V	DC 24V “+” output port	34	Stop/Maintained	Stop/Maintained signal input port
6	C1 relay port 1	Close position relay 1, normally open port 1			
7	C1 relay port 2	Close position relay 1, normally open port 2	35	Remote open	Remote open signal input port
8	C2 relay port 1	Close position relay 2, normally open port 1	36	Remote low voltage Common-port	ESD, stop/ Maintained,remote open/close input signal low voltage Common-port
9	C2 relay port 2	Close position relay 2, normally open port 2			
10	O1 relay port 1	Open position relay 1, normally open port 1	39	Manual/automatic input *	Manual/automatic mode select input port
11	O1 relay port 2	Open position relay 1, normally open port 2	40	Remote-high voltage Common-port -	ESD,stop/ Maintained,remote open/close input signal low voltage Common-port
12	O2 relay port 1	Open position relay 2, normally close port 1	41	Manual/automatic common-port *	Manual/automation low voltage common-port
13	O2 relay port 2	Open position relay 2, normally close port 2	42	Monitor relay port 1	Monitor relay contact normally close port
14	QO relay port 1	Open over torque protection relay contact, normally close port 1	43	Monitor relay port 2	Monitor relay contact common Port
15	QO relay port 2	Open over torque protection relay contact, normally close port 2	44	Monitor relay port 3	Monitor relay contact normally open port
18	Extended relay port 1***	This relay is as the flash alarming relay or the "Local/remote" Indication relay	45	Manual/automatic common-port *	Manual/automatic high voltage common-port
19	Extended relay port 2***		46	QC relay port 1	Close over torque protection relays contact normally close port 1
22	Valve position feedback signal (+) *	Valve position current signal feedback port (+)	47	QC relay port 2	Close over torque protection Relays contact,normally closeport 2

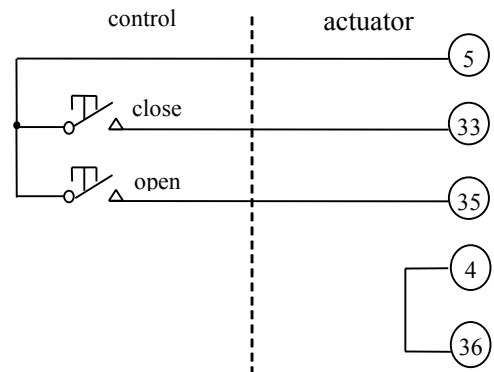
Notice: Mark of “**” Items are only used in single phase actuator, No.1 and No.2 port are connected with 220VAC, No.3 port is void; “*” Items is only used in type of extended actuator. “***” Items is not provided unless the clients specially noted in the sale order.

The above table “Terminals description sheet” is also suitable for the HKE range actuator.

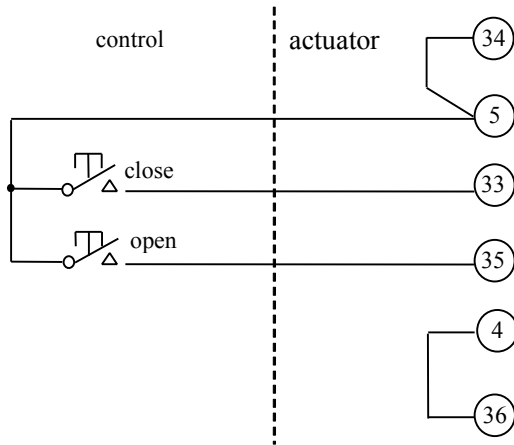
5. Control mode (also adapts to HKE range)

5.1 Local control

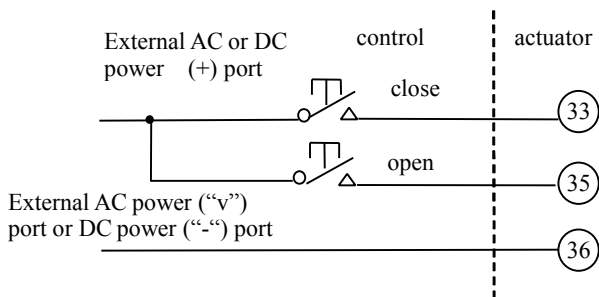
For all range HK actuators, when the mode selection knob positioned at the “Local Position” as well as operated the operation knob that can control the actuator open or close. The local operation mode of actuators can be setted as “Maintained local control ” or “Push to Run control” (according to the primitive parameter setting). In addition the setting tool can control the actuator open or close in “maintained local control” mode.



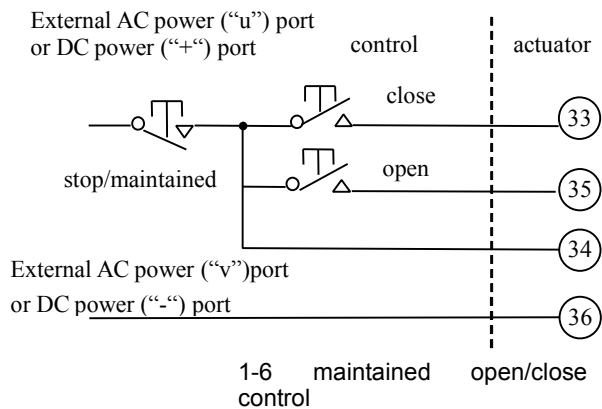
**1-1 push to run open/close control,
the valve intermediate
positioning
is possible**



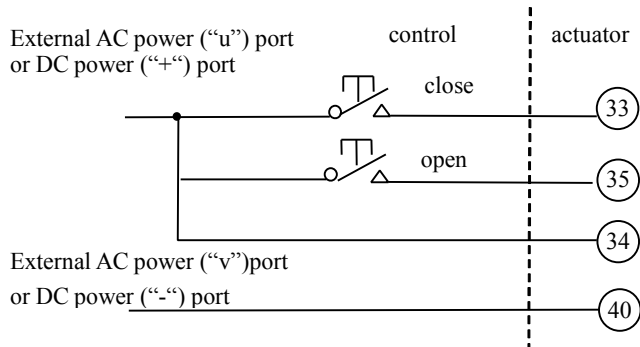
1-2 maintained open/close control, support reversion, intermediate positioning impossible



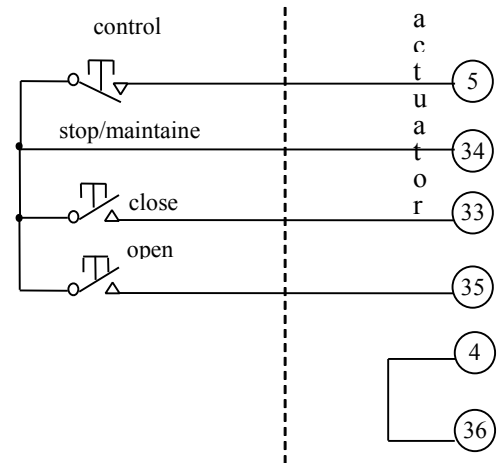
1-4 push to run open/close control, valve intermediate positioning is possible



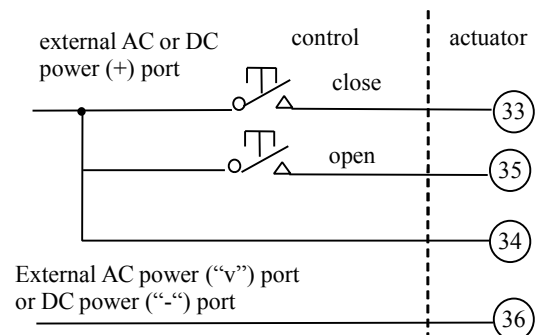
1-6 maintained open/close control



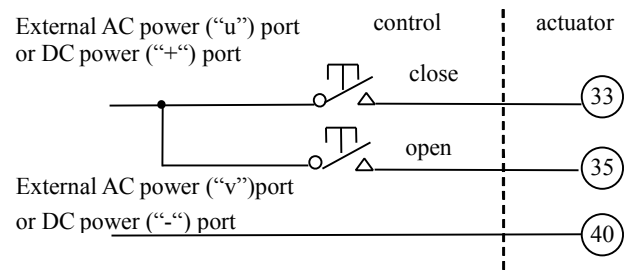
1-8 maintained open / close control, support reversion, intermediate positioning impossible



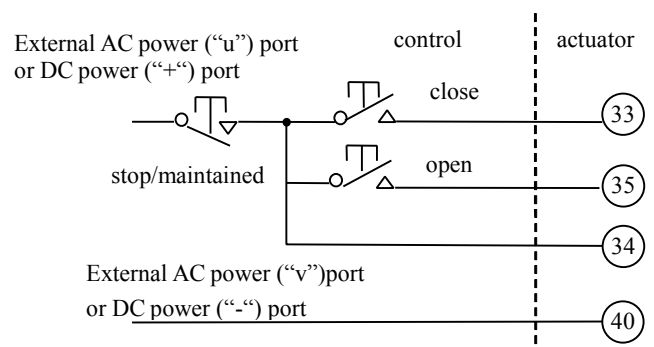
1-3 maintained open/close/stop control



1-5 maintained open / close control, support reversion, intermediate positioning impossible



1-7 push to run open/close control, valve intermediate positioning is possible



1-9 maintained open / close control

5.2 Remote control

The power supply of remote control circuits are provided as DC 24V by actuator internal supply or DC/AC 24V~60V, DC/AC120V~220V by external supply. Each remote control mode of wiring diagram refers to the above circuit diagram 1-1 and 1-9(all the numbers shown in the wiring diagram means the terminal port number). Shown circuit diagram 1-1 to 1-3 were DC 24V actuator internal power supply, diagram 1-4 to 1-6 were DC or AC 24~60V external power supply, 1-7 to 1-9 were AC 120~220V power supply.

5.3 ESD Control

The number of the ESD signal terminal port is No.25 and the common port number is 36 or 40 (refer to the above terminal explanatory table). While input a AC 110 ~220V or DC 24V circuit signal on the terminal port, actuator should be moved to the safety position that full close, full open, or stop position according to the preset operation parameter. More detailed about wiring, refer to "remote control" description.

5.4 Valve position feedback signal

Extended range HK provides 4~20mA signal proportional to valve position. Available at terminals 22 (+) and 23 (-), the maximum external load impedance is 400ohms. The Valve position feedback signal precision is 0.5%.

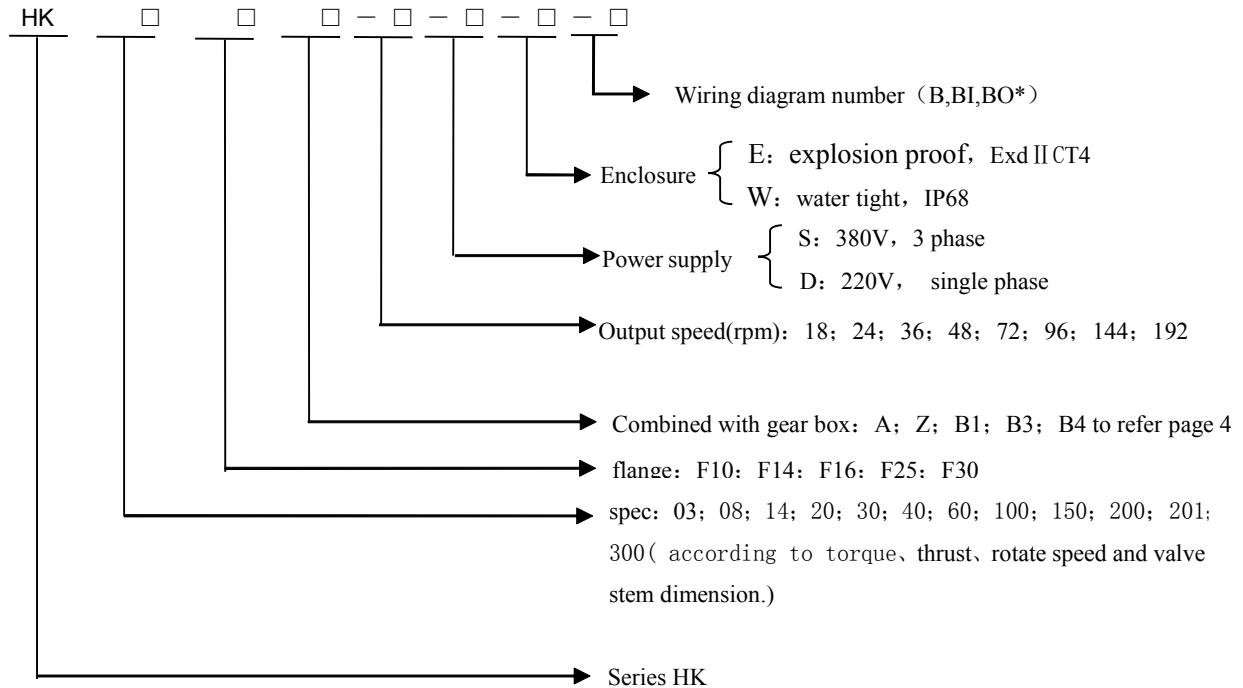
5.5 The analogue signal control

Extended range HK provides 4~20mA current signal to control the valve. The 4~20mA valve position control signal is inputted into the terminals 26(+) and 27(-). Thus you can use 4~20mA electric current signal to control the valve. For example, the 4mA electric current may make the valve to the full close position, the 20mA electric current signal can make the valve to the full open position.

6. Order

Please fully fill in following “product number suffix designations” while you order the actuators to us, the last suffix number of ordering information means the actuator model, and if you require order a gear box, you need to label its model number.

6.1 Product number suffix designations

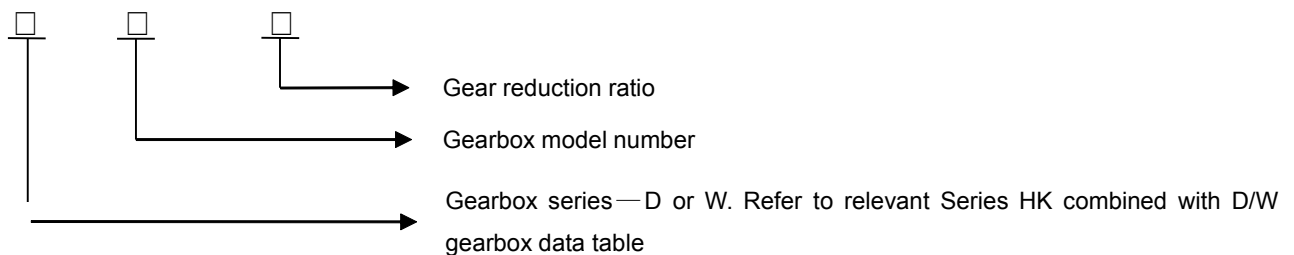


For instance: HK40-F14A-24-S-W-BIO

Output torque=400Nm, coupling flange=F14, drive coupling="A", output speed=24rpm, power supply= AC 380V, enclosure=IP68 water tight, wiring type=BIO.

*** Please refer to 4.1, 4.2.1**

6.2 Gearbox



Detailed information about the gearbox selection refer to the corresponding gearbox selection instructions.

For instance: W5-40 :1

Gearbox series=W series, model number= 5, gearbox reduction ratio= 40:1.

The actuator nameplate does not label the gearbox model number even if the actuator and the gearbox are assembled together and delivered, the gearbox have own nameplate and the gearbox model is labeled on it.

7. Machining of the Drive Bush

7.1 Thrust Base Type

1) Turn actuator onto its side, remove the two cap-headed screws holding base plate onto thrust base. Pull out the drive bush complete with its bearing assembly. Remove the thrust bearing of the drive bush's double end (The two thrust bearing stop ring near the mid bulgy – the shoulder of the drive bush need not be removed.) (Refer to diagram 1-1 ,1-2).

2) According to the thread dimension of the valve stem, machine the internal screw thread of the drive bush.

3) Remove all dirt from the drive bush and others components removed, ensuring that they are in good condition, clean and greased. According to the above steps, with reverse steps we can refit the drive bush and base assembly on the actuator, ensuring that the slots in the drive bush are located into the drive claw of the hollow output shaft. (The bearing modules must be topped with lubricating oil).



diagram 1-1



diagram 1-2



diagram 1-3

7.2 Non-Thrust Base Type (Refer to diagram 1-3).

1) Turn actuator onto its side and remove the base. The retaining clip on top of the drive bush can be seen now.

2) Turn the retaining clip slots until they reach the drive claw of the output shaft, or with a screwdriver remove the retaining clip. We can now remove the drive bush. According to the connection type of the configured valve, we can machine the hole of the drive bush shaft, key slot or combinative-claws, and refit the assembly on the actuator. Next, fit on the retaining clip and base. Before fitting on the base, lubricating – oil must be daubed between base and drive bush.

8. Installation of the Actuator

8.1 Installation with Visible Stem Valves:

8.1.1 Install the Thrust Base Type:

1. When leaving the factory, according to customer requests, the screw thread inside the drive bush has been machined well. The combination of actuator and drive bush is assembled with valve.

First, activate the hand – operating clutch, then place the actuator onto valve. Align the screw thread of the actuator and the valve stem. Wind the hand-wheel in the open direction to engage the drive bush onto the stem. Continue winding until the actuator is firmly connected to the valve flange. Wind two further turns, fit the securing bolts and tighten fully.

2. If the customer machines the internal screws of the drive bush, according to section 1.1, machine and fit them the drive bush. According to the above section “ 1 ”, install the assembly.

8.1.2 Installing the Non - thrust Base Type

Ensuring that the drive bushes of the non- thrust type has been machined, assemble the actuator and valve as a combined unit.

First, activate the hand – operating clutch of the actuator, then place the actuator onto the valve. Place the valve stem into the hole of the drive bush, or secure the combinative – claw of the drive bush to the combinative – claw of the valve. Wind the hand-wheel in open direction until the actuator is firmly connected to the valve flange. Wind two further turns, fit the securing bolts and tighten fully.

8.2 Installation with Valve and Gear Case

Check that the drive bush, input shaft, key and key slot are all appropriate or not. Fit the base and drive bush assembly on the actuator, then correctly place the actuator onto the flange of the gear case. Place the input shaft of the gear case into the hole of the drive bush shaft. Wind the hand-wheel, ensuring that the key is located into the key – slot of the drive bush. Finally, fit the securing bolts and tighten fully.

8.3 Installation with Hidden - Stem Valve

According to the section 2.1.2, use the same assembly method. If the actuator supports thrust, we should use the thrust – type connection with thrust bearing.

8.4 Hand-wheel Sealing

Ensure that the sealing plug in center of hand-wheel is sealed with PTFE tape and tightened fully. Ensure that moisture does not pass down the output shaft of the actuator.

8.5 Connecting to Terminals and Cable Entry

- 1). According to the control needs, connect the power wires and signal wires.
- 2). The actuator has specific ground terminals. To ensure that persons and equipment are safe, the actuator should be grounded correctly.
- 3). Only appropriate certified Explosion – Proof entry conduit plug may be used in hazardous locations. They must be waterproof and firm. Unused conduit plugs must also be sealed.

9. Operating your Actuator

9.1 Operating by Hand

The actuator provides operating a hand-wheel and Electric/Hand-wheel clutch lever. In special circumstances (e.g. main power failure or control circuit failure), the actuator can operated by hand. Before operating the hand-wheel, firstly set the mode selection knob to the “ stop ” or “ local ” position. To engage hand-wheel drive, depress the Electric/Hand-wheel clutch lever to “ Hand ” position. While the clutch lever is depressed, turn the hand-wheel slowly to engage the clutch. With the actuator in “ Hand-wheel ” mode, the lever can now be released and returned to its free position by its clockwork spring.

The actuator’s internal clutch has been latched in the “ Hand ” position. The hand-wheel will now drive the output shaft, thus enabling hand operating.

The clutch is skillfully designed, electric operation takes precedence over hand operation. When the actuator’s motor starts, the clutch will automatically switch to the electric operating position.

The clutch lever can be locked in the electric operation position or the hand operation position by a padlock. Please pay attention: if the lever is locked in the hand operating position by a padlock, motor operation will not automatically set clutch to the electric operation position.

9.2 Local Operation

If you want to use local operation, you should set the mode selection knob (red knob) to the local position. The actuator can now be controlled by the operation knob (black knob). Local operation has two modes: push to run and maintained. These are set by the setting tool. The two modes are described as follows:

Push to run: when you set the operation knob (black knob) to the close position, the actuator will turn in the closing direction. When you release the operation knob, it will return to the original position and the closing action will be stopped immediately. When you set the operation knob to the open position, the actuator will turn towards the opening direction. If the operation knob is released, the motor of the actuator will stop turn immediately.

Maintained: Turning the operation knob to the closing position will start the actuator running in the close direction. If the operation knob had been released, and return to the original position, however the actuator will continue running in the close direction. To start the actuator running in open direction, set the operation knob to the open position. If the operation knob had been released, and return to the original position, however, the actuator will continue to run in the opening direction.

9.3 Remote Operation

Details see above:

10. Debugging your Actuator

10.1 Intrinsically Safe Setting Tool.

The Setting Tool is used to be going to not invade type for actuator parameter set. If you want to use the Setting Tool, you must set the Mode Knob to the “Local” or “Stop” position beforehand. When a button is depressed on the Setting Tool, the relevant instruction is transmitted to the actuator via infra-red pulses. The Setting Tool must be pointed directly to the front of the actuator indicator window and at a distance no greater than 1.00m. The following describe Setting Tool button functions:

↓: Down Button. It is used for selecting the next item of the current menu. When the last item is reached, pressing the

Down Button again will return selection to the first item of the current menu.

+: Plus Button. Increase / Change displayed function's value or option setting.

-: Minus Button. Decrease / Change displayed function's value or option setting.

↵: Enter Button. Enter displayed value or option setting.

↶: Return Button. Return from current menu to previous menu.

R: Reset Button. If the actuator enters into an error condition, press this button and the Setting Tool will transmit a hardware reset signal to the actuator. The actuator will recover to the normal operation.

Notice: When Mode Knob is set to the "Local" position, pressing the "+" button and "↓" button simultaneously will cause the actuator to execute the "Local Opening" action. Pressing the "-" button and "↵" button simultaneously will cause the actuator to execute the "Local Closing" action.

Setting Tool Model: HK;

Explosion-Proof Mark: Exia IICT4;

Working Condition: Temperature: $-30^{\circ}\text{C} \sim +50^{\circ}\text{C}$, Relative Humidity: $\leq 95\%$, Atmospheric pressure: $0.86 \text{ MPa} \sim 1.06 \text{ MPa}$,

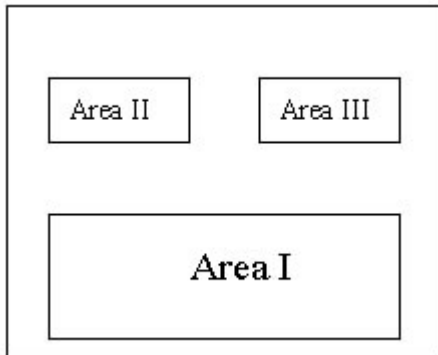
Power Supply: two common size 5 batteries.

Setting Tool Notes: 1. Do not remove the back cover in the hazardous areas; 2. Do not replace or alter the components and configuration if they affect the Explosion-Proof capabilities of the Setting Tool; 3. The Setting Tool should be cleaned with cleaning agent or damp cloth.

Attention: Setting Tool is not available if: 1) the Mode Knob is lying in the "Remote" position, 2) in the "Local" position with the motor is running, 3) the motor is stopped but still in the non-action pause (2 seconds) after each motor motion.

10.2 Operation Setting

On the surface of the electrical cover, there is a display LCD. There are three areas on the LCD.



Area I: display of the valve position;

Area II: display of operation setting or the status alarm. Operation settings start with the character "H"; status alarms start with characters "F" or "A".

Area III: display of operation setting values or the status of the battery. During the operation parameter configuration, this area displays the parameter value. During normal operation, this area will display "00" when the electrical amperage of the battery is insufficient, meaning the battery must be changed.

With the Mode Select knob (red knob) at the "Stop" or "Local" position, aim the setting tool at the display screen. Depressing any button other than the reset button will cause the LCD to display "H—01" in area II. Using "↓" key, area II will cycle through the following codes:

H—01: the option of Direction to Close

H—02: the option of Valve-position Control Current Calibration

H—03: the option of Local Control Mode

H—04: the option of Closing Limit Protection

H—05: the option of Closing and Opening Torque Protection

H—06: the option of Dead-band Range Modulation

H—07: the option of ESD (Emergency Shutdown)

H—08: the option of Losing Signal

H—09: the option of Limit Position Setting

H—10: the option of Current Torque Display

H—11: the option of Remote Control Priority

H—12: the option of Inhibit Moving Time

H—13: the option of Feedback Electric-current Modulation (this function is not provided unless the clients specially declaring)

For any of the above options, you can use the setting tool “↓” button to select the submenu and the enter button enter that submenu. The following describe each submenu option and operating setting.

10.2.1 The option of Direction to Close

The running direction of the output shaft can be set by this item. In the “H—01” menu, area III will display “0”(Clock-wise operation) or “1”(Anti-clockwise operation). The number of the first displayed is the default value. Use the “↓” Button to change the number and use the enter button for confirmation .

10.2.2 The option of Valve-position Control Current Calibration

If you want to use the 4~20mA analogue signal to control the valve position, you must enter this menu to calibrate the electric-current signal. Before calibration you must input the electric-current signal into the terminals 26(+) and 27(-) of the sunflower-pan. Enter into the menu "H-02", area III will display "0" (4mA calibration), depress "↓" button the area III will display "1" (20mA calibration).

When the area III display "0", depress "enter button", area II will display "H-20", area III will display the electric-current that the actuator collected. Area I will display the default valve position opening that the 4 mA calibrated. You can change the valve position opening value by the "+" or "-" button. At this moment, you must input the 4 mA electric-current into the terminals 26 (+) and 27 (-), and let the valve position opening be changed to the required value, then depress the "enter button" calibration, this process is called as " Low signal calibration".

When the area III display "1", depress "enter button", area II will display "H-21", area III will display the electric-current that the actuator collected. Area I will display the default valve position opening that the 20 mA calibrated. You can change the valve position opening value by the "+" or "-" button. At this moment, you must input the 20 mA electric-current into the terminals 26 (+) and 27 (-), and let the valve position opening be changed to the required value, then depress the "enter button" for calibration, this process is called as " High signal calibration".

Notice: If your electric-current signal is 2~10mA, you must specially declare in your order form.

You can also use 1~5V electric-voltage signal to control the actuator, but we do not commend using the electric voltage signal to control the actuator, because the electric-current signal is better than the electric-voltage signal for the anti-jamming.

10.2.3 The option of the Local Control Mode

In this menu, you can select “Push to Run” or “Maintained” local operation mode. Upon entering the “H—03” menu, area II will display “0” (Push to Run) or “1”(Maintained). The number of the first display is the setted sets value. Use the “↓” button for selection and use the "enter button" for confirmation .

10.2.4 The option of the Closing Limit Protection

In this menu, you can activate or de-activate the Limit Protection in the closing direction. In the “H—04” menu, area III will display “0”(No Protection) or “1”(Protection). The number first displayed is the default value. Use the “↓”button for selection and the enter button for confirmation . If you select "0" (No Protection), when the actuator runs to the closing limit position, the red LED will be lightened but the actuator will not stop unless the current torque is bigger than the closing torque protection.

10.2.5 The option of the Closing and Opening Torque Protection

Upon entering the torque trip submenu ("H—05"), when area III displays "0", depress the "enter button", area II will display "H-50", and the area III will display the close torque protection value setted formerly, the range can be varied between 40% and 120% of rated torque. Select the required torque protection value by using the "+" button to increase, or the "-" button to decrease, Press the "enter button" for setting confirmation.

Upon entering the torque trip submenu ("H—05"), when area III displays "1", depress the "enter button", area II will display "H-51", and the area III will display the open torque protection value setted formerly, the range can be varied between 40% and 120% of rated torque. Select the required torque protection value by using the "+" button to increase, or the "-" button to decrease, Press the "enter button" for setting confirmation.

10.2.6 The option of Dead-band Range Modulation

Upon entering the submenu ("H—06"), area III displays the dead-band value setted formerly, the range can be varied between 3% and 60% of the full stroke. Select the required value by using the "+" button to increase, or the "-" Button to decrease, Use the "enter button" for setting confirmation.

10.2.7 The option of the ESD (Emergency shutdown)

This function is used to stipulate the actuator's action in the emergency circumstances. Upon entering the "H—07" menu, area III will display "0" (Execute the close action) or "1" (Execute the open action) or "2" (No moving). The number first displayed is the default value. Use the "↓" button for selection and the "enter button" for confirmation. If "0" or "1" is selected and confirmed, area II will display "H—70". In this menu, area III will display "0" (Low-Voltage Active) or "1" (High-Voltage Active). The initial value displayed is the default value. Use the "↓" button for selection and the "enter button" for confirmation.

10.2.8 The option of losing signal

When the 4~20mA electric-current signal is losed or this electric-current signal is less than the half of the "Low signal calibration", this menu can decide that the actuator will be excuted what action. Enter into this menu, the area III will display "0"(Execute the close action), "1"(Execute the open action), or "2"(No moving). The initial value displayed is the default value. Use the "↓" button for selection and the "enter button" for confirmation.

10.2.9 The option of the Limit Position Setting

This item decides the limit position of the valve. When area II displays "H—09", you can depress the "enter button". Area III will display "0" (close limit position), or "1" (open limit position).

When area III displays "0", depress the "enter button", the actuator will confirm this position as the full close limit position of the valve. At this moment the red LED will be lightened, area I will display 0. Don't exit from the menu and don't depress the "↓: Down Button". Then you can use the hand-wheel or the opening operation of the "Local" mode to let the actuator run up to the full open limit position. In order to protect the actuator and the valve, we commend that you must turn the actuator to the close direction half circle or one circle. At this moment you can depress the "enter button", the green LED will be lightened and the actuator will confirm this position as the full open limit position, the area I will display 100. Then the actuator's stroke is performed.

10.2.10 The option of the Current Torque

Red knob is placed at the local position. Enter into the "H—10" menu. When opening or closing the valve, the current torque percentage is displayed in the area III, and the current valve position (opening percentage) is displayed in area I.

10.2.11 The option of Remote Control Priority

When the Remote opening signal and Remote closing signal exist at the same time, this item is used to decide that who has the priority.

After entering the "H-11", area III will display "0" (Open firstly), "1" (Close firstly), or "2" (Inhibit moving). The number of the first displayed is the default value. Use the "↓" button to change the number and use the enter button for confirmation.

If you select "1", when the Remote opening signal and Remote closing signal exist at the same time, the actuator will perform closing action only. Similarly, if you select "0", when the Remote opening signal and Remote closing signal exist at the same time, the actuator will perform opening action only. If you select "2", when the Remote opening signal and Remote closing signal exist at the same time, the actuator will do not move, and display error signal "F-21" at the area II on the LCD.

10.2.12 The option of Inhibit Moving Time

Enter into the "H-12" menu, area III will display number between 1 and 99, this means the "inhibit moving time" is between 0.1 and 9.9 seconds. You can use the "+" or "-" button to modulate the number of the area III. Then use the "enter button" to affirm the parameters.

10.2.13 The option of Feedback Electric-current Modulation for the Full Close Position (this function is not provided unless the clients specially declare)

This menu is only used for the feedback electric-current's increase or decrease modulation of the full close position.

After entering into "H-13" menu, area III will display "0" or "1". When display "0", that means the increase modulation of the feedback electric-current. Depress the "enter button" and enter into the sub-menu "H-31", area III will display number between 0 and 99, this means the increase value of the feedback electric-current.

After entering into "H-13" menu, area III will display "0" or "1". When display "1", that means the decrease modulation of the feedback electric-current. Depress the "enter button" and enter into the sub-menu "H-32", area III will display number between 0 and 99, this means the decrease value of the feedback electric-current.

When you want to make the feedback electric-current increase, you must make the number in the submenu "H-31" increase and at the same time you must make the number in the submenu "H-32" to be changed as 0.

When you want to make the feedback electric-current decrease, you must make the number in the submenu "H-32" increase and at the same time you must make the number in the submenu "H-31" to be changed as 0.

11. Alarm Message Display

When the actuator is running, alarm signals are displayed in the alarm area (area II) of the LCD screen. The following list the alarm codes and their meanings:

- (1) F—01(Instruction Error): On power-up self-diagnostic, if an instruction is bad, this message will be displayed.
- (2) F—02(ROM Error): On power-up self-diagnostic, if the Read-Only Memory (ROM) is bad, this message will be displayed.
- (3) F—03(RAM Error): On power-up self-diagnostic, if the Random Access Memory (RAM) is bad, this message will be displayed.
- (4) F—04(A/D Error): On power-up self-diagnostic, if the A/D is bad, this message will be displayed.
- (5) F—05(Reset Limit Position): If the actuator's valve position is bad, you must set the open/close limit position again.
- (6) F—06(Torque over): When the actuator starts up, if the torque exceeds maximum torque, the actuator will stop and display this message.
- (7) F—07(Memory Error): A memory error occurred while the actuator is running. There are two possible reasons for this error: One is random, requiring only that actuator be reset with the setting tool; the other possible reason is that the RAM is damaged, in which "F—07" displays even after actuator is reset. Damaged RAM (the second possibility) requires changing the main-board.
- (8) F—08(Valve Position Overrun): When the actual valve position exceeds the allowed tolerance of the limit open, this alarm sign will be displayed. If the overrun or under-run signal appears, the valve position counter value is wrong. The limit open and close limit should be reset.
- (9) F—09(Valve Position Under-run): When the actual valve position is less than the allowed minimum, this alarm sign will be displayed. If the overrun or under-run signal appears, the valve position counter value is wrong. The limit open and close

limit should be reset.

- (10) F—10(Counter Overflow): When the actual valve position counter value is more than the allowed maximum, this alarm message will be displayed.
- (11) F—11(Close Torque Over): On actuator closing, if the torque exceeds the setted protection value, the actuator will stop and not proceed any further in the close direction. And the “F—11” alarm message is displayed in this circumstance. In order to clear the “Close Torque Over” alarm, let the actuator run in the open direction a few times or reset the close torque protection trip value.
- (12) F—12(Open Torque Over): On actuator opening, if the torque exceeds the setted protection value, the actuator will stop and can not proceed any further in the open direction. And the “F—12” alarm message is displayed. In order to clear the “Open Torque Over” alarm, let the actuator run in the close direction a few times or reset the open torque protection trip value.
- (13) F—13(Loss Phase): when the actuator is running, if the power supply loses phase, the actuator will stop. This message is displayed
- (14) F—14(Temperature Over): when the temperature of the motor exceeds limit, the actuator will stop and this message is displayed.
- (15) F—15(Motor Stalled): When the actuator is running, if the actuator can't detect the valve position change in five seconds, it will stop and display this message.
- (16) F—16(Power Down): If the main power fails, this alarm is displayed.
- (17) F—17(Direction Errors): If the actuator's running direction is wrong, this alarm message will be displayed.
- (18) F—18(ESD Closing): If ESD is enabled and the ESD signal is active, the actuator is executing ESD close. This message displayed during ESD close.
- (19) F—19(ESD Opening): If ESD is enabled and the ESD signal is active, the actuator is executing ESD open. This message displayed during ESD close.
- (20) F—20(ESD Effective): When the ESD is enabled and the ESD signal is active, the actuator is executing the “ESD” operation. During this time, additional instructions to open or close the actuator, while the ESD signal is still active, will not be effective. This alarm signal will be displayed in this situation.
- (21) F-21(Remote signal exist at the same time): In the menu "H-11", if you select "2", when the Remote opening signal and Remote closing signal exist at the same time, the actuator will do not move, and display error signal "F-21" at the area II on the LCD.
- (22) A—01(Instruction Ok): On power-up self-diagnostic, if the micro-controller's instruction is good, this message will be displayed.
- (23) A—02(ROM Ok): On power-up self-diagnostic, if the ROM is ok, this message will be displayed.
- (24) A—03(RAM Ok): On power-up self-diagnostic, if the RAM is ok, this message will be displayed.
- (25) A—04(A/D Ok): On power-up self-diagnostic, if the A/D is ok, this message will be displayed.

12. Lubrication and Maintenance

To ensure the actuator's smooth running, the HK actuators must use the lubricating agents in the following table. Improper lubrication may adversely affect the dependability of the actuator. The temperature range of the environment is $-22^{\circ}\text{F}/-30^{\circ}\text{C} \sim -160^{\circ}\text{F}/+70^{\circ}\text{C}$. In the extreme climates, there are special requirements: Movement Viscosity at 100°C , flash point of 150°C at minimum, and solidifying point at not more than -45°C .

Lubrication table:

Manufacture Unit	Lubrication trademark
Beijing Changcheng Lubrication CO.,LTD USA	Burthen vehicle gear wheel oil 75W/90 Mobil SAE80EP

If your actuator has run for six months, change the lubrication once a year.

Lubrication Capacity:

Actuator Spec	Capacity	Actuator Spec	Capacity
HK03	0.3	HK60	1.1
HK08	0.3	HK100	7.5
HK14	0.3	HK150	7.0
HK20	0.8	HK200	7.0
HK30	0.8	HK201	7.0
HK40	0.8	HK300	7.0

Machine Maintenance:

If your actuator has run for six months, you must tighten the installation bolts.
Every actuator has been fully tested before leaving the factory to provide years of trouble free operation.

If your actuator can not be installed immediately, store it in a dry place until you are ready to connect incoming cables. Don't pull out the transit cable entry plugs until you are ready to connect incoming cables.

At the same time you

must pull out the battery until you are ready to install the actuator.

13. Changing Battery

When the battery's power level displays "55", the battery is low and should be changed quickly. If the battery's power level is "00", the battery is exhausted and must be change immediately. Change the battery while the main power is on. Set the Mode Knob to the "Stop" position before changing the battery. After changing, set mode knob to the primary position.

Notice: If the battery's power level is "00" and main power is down, we do not ensure current valve position value will be correct after changing the battery. In this circumstance, you should check that the valve position value after changing is the same value before changing the battery. If the value is not the same, you should set the

limit position value again (refer to H-09).

14. Important Notices

1). In order to ensure that the torque limit protection value of the close/open direction is appropriate, set the Mode Knob to the “Local” position. Allow the liquid medium to flow through the valve and let the actuator run forward and backward in the open and close direction several times. At the same time, you should adjust the torque limit protection value, in order to ensure that there is no excessive torque while the actuator is in operation.

2). In the following three instances, you must check that the limit open and limit close values are correct.

a) Changing the battery while the main power is down.

b) Main power is down, the battery is exhausted and there is no display on the LCD screen.

c) The following alarms occur when the actuator is running:

Memory Errors (May reset it with the Setting Tool)

Valve Position Overrun

Valve Position Under-run

Set the Valve Position again

15. Fault is handled

1). The loss phase

The loss phase of the actuator is divided the static and movement. In the “local control” mode, you operate the actuator; if the “loses phase” is presented immediately it is the static loss phase; or if the “loses phase” is presented late 1~2 seconds, it is the movement loss phase.

1.1) The reason and process of the static loss phase

Reason 1: one loss phase of three phases power for the actuator

Process 1: to check-up the voltages of the terminal box of the actuator, and eliminate the loss phase.

Reason 2: fallibility of the links in the actuator

Process 2: to re-connect the links in the actuator

Reason 3: element damages on the power board in the actuator

Process 3: to change the power board in the actuator

1.2) The reason and process of the movement loss phase

Reason 1: fallibility of the links in the actuator

Process 1: to re-connect the links in the actuator

Reason 2: the ac contactor damages in the actuator

Process 2: to change the ac contactor in the actuator

Reason 3: the motor damages in the actuator

Process 3: to change the motor in the actuator

Reason 4: element damages on the power board in the actuator

Process 4: to change the power board in the actuator

2). The Motor Stalled

Reason 1: the electric/Hand-wheel clutch lever of the actuator Lock to die.

Process 1: after to reset the actuator using Setting Tool, to operate electrically the actuator and turn the hand-wheel at the same time, and to ensure the clutch to the electric operation position.

Reason 2: the ac contactor damages in the actuator
 Process 2: to change the ac contactor in the actuator

3). Power Down

Reason 1: the fault of power source of the user.
 Process 1: to inspect the power source and remove the fault.

Reason 2: the fuse damages on the power board in the actuator
 Process 2: to change the fuse

Reason 3: the transformer damages in the actuator
 Process 3: to change the transformer in the actuator

Reason 4: fallibility of the links in the actuator
 Process 4: to re-connect the links in the actuator

4). Temperature Over

Reason 1: the motor turns for long time, the temperature of motor is over 130°C.
 Process 1: to suspend the motor turn, and to resume the motor turn after the temperature drop to 90°C.

5). Close Torque Over

Reason 1: the protection value for torque trip is little small.
 Process 1: to increase the protection value for torque trip by using the Setting Tool.

Reason 2: the type selecting of the actuator does not match with the condition on-the-spot
 Process 2: to change the actuator for suitable type

Reason 3: the transformer damages in the actuator
 Process 3: Outside has the factor that obstructs normal operation

6). Open Torque Over

Reasons and process are similar with Close Torque Over.

7). Valve Position Overrun

Reason 1: the valve position value for the actuator is lost.
 Process 1: to reset the actuator with Setting Tool and set the Limit close position and the Limit open position again.

8). Valve Position Under-run

Reasons and process are similar with Valve Position Overrun.

9). The remote mode not to control

Reason 1: the mode selection knob (red knob) not placed at the remote position.
 Process 1: to place the mode selection knob at the remote position.

Reason 2: element damages on the knob board in the actuator
 Process 2: to change the knob board in the actuator

Reason 3: fallibility or incorrect of the links of the terminal box of the actuator in the actuator
 Process 3: to check-up the links and ensure the links correct

10). The abnormal of the display after power on

Reason: the actuator is not reset Reliably after power on.
 Process 1: to reset the actuator with Setting Tool.
 Process 2: to cut off the actuator's power source, and take out its battery, after waiting 15~20 minutes, to power on again.
 Process 3: to change the main control board in the actuator

11). The exterior of the actuator seeps oil

Reason: the Oil tie screw of the actuator looses.

Process 1: to tight firmly the screw and apply to wipe oil stain.

Chapter three HKC range intelligent electrical actuator selection, installation and debugging instructions

1. Summarizing

HKC actuators are suitable for intermittent control in automatic control loops that the system rate of change is not more than 600 starts per hour . For the long travel, it should providing the average torque required by the valve in mid stroke does not exceed 33% of the rated torque of the selected actuator. The HKC actuator continual operation time is 15 minutes and motion proportion is 33.3%. The HKC series actuator has the same function as the HKM series actuator. The operation menu is also the same as the HKM series actuator. The HKC series actuator derives from the HKM series actuator, but the HKM series actuator's start frequency is 1200 starts per hour under the modulating torque. When you need high start frequency, you must select the HKM series actuator not the HKC series actuator.

2. Actuator specification

2.1 Input signals:

4mA~20mA;1VDC~5VDC;
2mA~10mA;0.5VDC~2.5VDC;
24VDC pulse or voltage signal;
220VAC voltage signal.

2.2 Power supply:

380VAC/50Hz
220VAC/50Hz

2.3 Valve controlling error $\leq \pm 2.5\%$

2.4 Travel controlling mechanism repeatability error $\leq 3\%$

2.5 Dead-band: 0.1~9.9% of the total travel

2.6 Watertight enclosure: IP68

2.7 Anti explosive mark: Exd II CT4

2.8 Ambient temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$

2.9 Ambient humidity: $\leq 95\%$

3. Actuator features

3.1 Actuator working theory

Please refer to: Section 3.1, Chapter one

3.2 Function features

Please refer to: Section 3.2, Chapter one

3.2.1 Double-sealed

Please refer to: Section 3.2.1, Chapter one

3.2.2 Non-intrusive design

Please refer to: Section 3.2.2, Chapter one

3.2.3 Protection features

Please refer to: Section 3.2.3, Chapter one

3.2.4 Torque and valve position measure

Please refer to: Section 3.2.4, Chapter one

3.2.5 Intermittent timing operation

Please refer to: Section 3.2.5, Chapter one

3.2.6 Fieldbus network control

Please refer to: Section 3.2.6, Chapter one

3.2.7 Actuator commissioning and maintenance

Please refer to: Section 3.2.7, Chapter one

3.2.8 Actuator display

Please refer to: Section 3.2.8, Chapter one

3.2.9 Actuator operation mode

Please refer to: Section 3.2.9, Chapter one

3.2.10 Advanced design

Please refer to: Section 3.2.10, Chapter one

3.2.11 Actuator explosion proof design

Please refer to: Section 3.2.11, Chapter one

3.2.12 Electronic latching

Please refer to: Section 3.2.12, Chapter one

3.2.13 Data save

Please refer to: Section 3.2.13, Chapter one

3.2.14 Application range

HKC actuators are suitable for intermittent control in automatic control loops that the system rate of change is 600 starts per hour. For the long travel, it should providing the average torque required by the valve in mid stroke does not exceed 33% of the rated torque of the selected actuator. The HKC actuator continual operation time is 15 minutes and motion proportion is 33.3%. If the applications need high start frequency, please select the HKM series actuator.

The basic HKC actuator is Multi-turn electrical actuator, it suitably drives the linear motion valve such as gate valve. If clients need bigger output torque, can select D gearbox. If the actuator applies to the rotary motion valve, it should match with W rotary gearbox. The type of D and W gearbox are one level reduce rate gearbox, the reduce rate are 40:1、60:1、70:1, the multilevel reduce rate is more than 80:1. The data of range HKC actuator coupling with gearbox see table 4-4, more details of gearbox information please contact us.

4: Technical Data

4.1 HKC range actuator performance (220VAC/50Hz)

Please refer to: Section 3.1, Chapter two

4.2 HKC range actuator performance (380VAC/50Hz)

Please refer to: Section 3.2, Chapter two

4.3 Technical data of worm gearbox combined with series HKC actuator (220VAC/50Hz)

Please refer to: Section 3.3, Chapter two

4.4 Technical data worm gearbox (380VAC/50Hz)

Please refer to: Section 3.4, Chapter two

4.5 Valve/Actuator interface

Please refer to: Section 3.5, Chapter two

5: Actuator Performance

5.1 Torque and position

Please refer to: Section 5.1, Chapter one

5.2 Cable entry and connecting terminals

Please refer to: Section 5.2, Chapter one

5.3 Drive bush base data

Please refer to: Section 5.3, Chapter one

5.4 Mounting data

Please refer to: Section 3.6.1~3.6.8, Chapter two

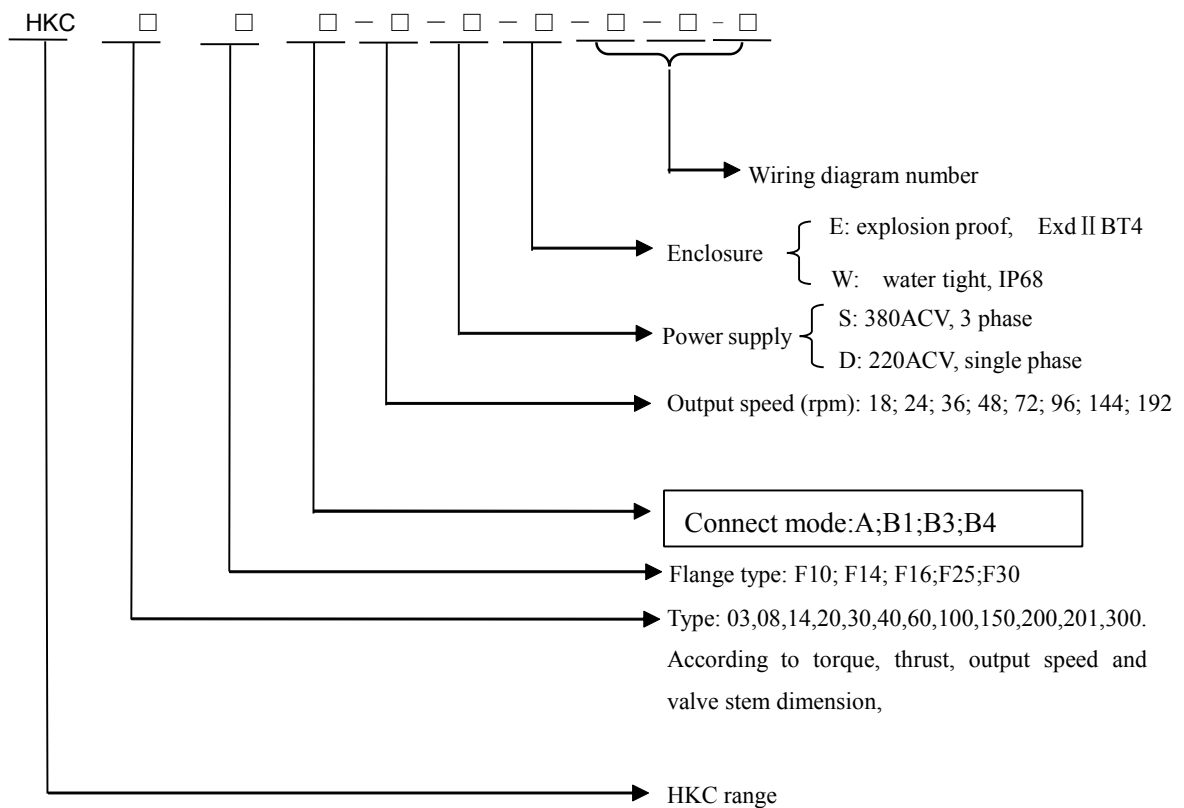
6 Actuator Control and wiring

Please refer to: Section 6, Chapter one

7 Order Introduces

Model designation must be noted the each item, for example the wiring diagram number means the actuators versions, and if you require order a gearbox, you need to fill upon its model number.

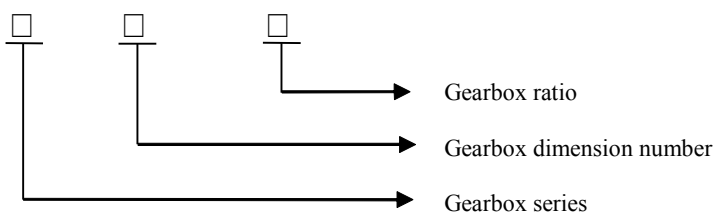
■ Actuator model number



Example: HKC20F14A-24-S-W-101-03

Means: actuator rated torque: 200N.M; flange type: F14; drive bush type: A; output speed: 24; Power supply: 380ACV; enclosure: IP68 water tight; appending analogue signal input, valve position signal feedback, battery low alarm relay, remote control select alarm relay and thermostat tripped alarm relay.

■ Gearbox



Detail information can be found on the corresponding technical data sheets.

Example: W5- 40: 1

Means: W series; dimension number: 5; gearbox ratio: 40:1.

Even if the actuator and gearbox are provided all together, the model of the gearbox is not marked on the identification plate of the actuator. There is an individual identification plate on the gearbox; on it marked with model of the gearbox and so on.

8: Machining of the Drive Bush

Please refer to: Section 8, Chapter one

9: Installation of the actuator

Please refer to: Section 9, Chapter one

10. Operating your Actuator

Please refer to: Section 10, Chapter one

11. Debugging your Actuator

Please refer to: Section 11, Chapter one

12. Display of the Alarm Signal

Please refer to: Section 12, Chapter one

13. Machine Maintenance

Please refer to: Section 13, Chapter one

14. Changing Battery

Please refer to: Section 14, Chapter one

15. Important Notices

Please refer to: Section 15, Chapter one

Chapter four HKE range intelligent electrical actuator selection, installation and debugging instructions

HKE actuators are suitable for intermittent control in automatic control loops that the system rate of change is not more than 1200 starts per hour under the modulating torque. For the long travel, it should provide the average torque required by the valve in mid stroke does not exceed 50% of the rated torque of the selected actuator. The HKE actuator continual operation time is 15 minutes and motion proportion is 50%. The HKE series actuator has the same function as the HK series actuator. The operation menu is also the same as the HK series actuator. The HKE series actuator derives from the HK series actuator, but the HKE series actuator's start frequency is 1200 starts per hour under the adjustive torque. When you need high start frequency, you must select the HKE series actuator not the HK series actuator.

1. Advanced design

1.1 Specification:

1.1.1 Input signals:

4mA~20mA;1VDC~5VDC;
2mA~10mA;0.5VDC~2.5VDC;
24VDC pulse or voltage signal;
220VAC voltage signal

1.1.2 Power supply:

380VAC/50Hz
220VAC/50Hz

1.1.3 Valve controlling error $\leq \pm 1.5\%$

1.1.4 Travel controlling mechanism repeatability error $\leq 1\%$

1.1.5 Dead-band: 0.3~6.0% of the total travel

1.1.6 Watertight enclosure: IP68

1.1.7 Anti explosive mark: Exd II CT4

1.1.8 Ambient temperature: -40℃~+70℃

1.1.9 Ambient humidity: $\leq 95\%$

2 . Applications

Please refer to:Section 2 , Chapter two

3. Technical Data

3.1 HKE range multi-turn actuator performance (220VAC / 50Hz)

Please refer to:Section 4 "Table4-2", Chapter one

3.2 HKE range multi-turn actuator performance (380VAC / 50Hz)

Please refer to:Section 4 "Table4-1", Chapter one

3.3 Dimension table of the interface

Actuator type	HKE03/HKE05	HKE10/HKE20	HKE55
Type A			
Rated thrust KN	44	100	150
Max bore			
Outside bore mm	32	51	67
Inside bore mm	26	38	57

Type B			
B1 mm	42	60	80
B3 mm	20	30	40
B4 mm	20	30	44
Hand-wheel gearbox ratio			
Standard	Directly	Directly	Directly
Extra option	—	—	—
Flange size	F10	F14	F16
Net weight	33	55	80

3.4 Parameters of the linear-travel actuator(380VAC/50Hz)

Please refer to:Section 4 "Table4-4", Chapter one

3.5 Parameters of the liner-travel actuator(220VAC/50Hz)

Please refer to:Section 4 "Table4-5", Chapter one

3.6 HKE range actuator with W range gearbox combination data

Combination	Rated Torque (N.m)	Stroke Time (s)	Actuator RPM (rpm)	Gearbox Ratio	Max Bore (mm)	Combination	Rated Torque (N.m)	Stroke Time (s)	Actuator RPM (rpm)	Gearbox Ratio	Max Bore (mm)
HKE03B4/ W4	410	29	36	70:1	64	HKE10B4/ W6	1770	29	36	70:1	102
HKE03B4/ W4	280	25	24	40:1	64	HKE10B4/ W6	2052	44	24	70:1	102
HKE03B4/ W4	267	33	18	40:1	64	HKE20B4/ W6	2734	22	48	70:1	102
HKE03B4/ W4	418	44	24	70:1	64	HKE10B4/ W6R	2537	29	72	140:1	102
HKE05B4/ W4	558	25	24	40:1	64	HKE10B4/ W6R	2750	44	48	140:1	102
HKE05B4/ W4	723	22	48	70:1	64	HKE10B4/ W7	2016	38	24	60:1	127
HKE05B4/ W4	535	33	18	40:1	64	HKE20B4/ W7	3328	25	36	60:1	127
HKE05B4/ W4	789	29	36	70:1	64	HKE20B4/ W7	3784	38	24	60:1	127
HKE03B4/ W4R	447	25	48	80:1	64	HKE10B4/ W7R	2690	38	48	120:1	127
HKE03B4/ W4R	503	33	36	80:1	64	HKE10B4/ W7R	3640	38	72	180:1	127
HKE05B4/ W5	438	25	24	40:1	76	HKE20B4/ W8	3800	38	24	60:1	153
HKE05B4/ W5	842	22	48	70:1	76	HKE55B4/ W8	6370	25	36	60:1	153
HKE05B4/ W5	417	33	18	40:1	76	HKE55B4/ W8	6830	38	24	60:1	153
HKE05B4/ W5	915	29	36	70:1	76	HKE20B4/ W8R	4880	38	48	120:1	153
HKE05B4/ W5	1014	44	24	70:1	76	HKE20B4/ W8R	7325	38	72	180:1	153
HKE03B4/ W5R	525	38	48	120:1	76	HKE20B4/ W8R	6072	38	36	60:1	153
HKE05B4/ W5R	695	25	48	80	76	HKE55B4/ W9	6211	25	24	60:1	178
HKE05B4/ W5R	760	33	36	80	76	HKE55B4/ W9	15412	38	72	180:1	178
HKE05B4/ W5R	1618	44	48	140	76	HKE55B4/ W9R	17004	38	24	60:1	203.2
HKE05B4/ W6R	1618	44	48	140	102	HKE55B4/ W10	17148	38	72	180:1	203.2

4. Coupling dimension

Please refer to: Section 5.7.1~5.7.6, Chapter one

5. Actuator electrical wiring diagram

Notice: all the numbers shown in the wiring diagram means the terminal port number.

5.1 HKE range basic type (wiring diagram E)

HKE range basic type may control motors rotary orientation without any external control relay (cabinet) and the ways of control include: Local control, remote control and ESD control. The wiring diagram of about remote controlling refer to figures from 1-1 to 1-9. This series actuators also provide single phase AC motor, terminal port 1 and 2 are power supply input with AC220V, port 3 is not used

Actuators wiring diagram refer to the right-side figures.

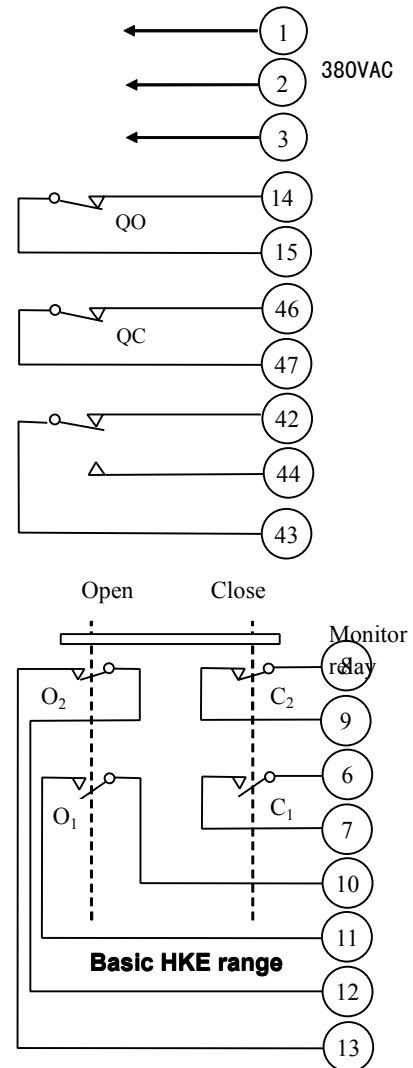
O1/C1 – normally opening contact; when the open/close limit position, the contact is closed.

O2/C2 – normally closing contact; when the open/close limit position, the contact is open.

QO/QC – normally closing contact; when open/close over torque, the contact is open.

Above relays contract rating 5A/250VAC or 5A/30VDC.

The monitor relay contract rating 5A/250VAC or 5A/30VDC. While monitor relay do not be at de-energized, terminal port 43 link with 42; while monitor relay is at energized, port 43 does not link with 42 but links with 44. In following cases relay should be at de-energized: Main power supply failed or phase lose; main control circuit failed; Local/remote selection knob at Local; thermostat tripped. All above that, monitoring the Local/remote control status by monitor relay is possible.

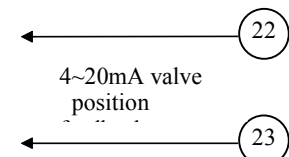


5.2 HKE range enhanced type (wiring diagram EI,EO,EIO)

The enhanced HKE range is added a 4 ~ 20mA feedback signal module and a 4~20mA valve position control signal module to the basic type HKE range, its wiring diagram is divided into three kinds, first one is EI (add a 4~20mA valve position control signal module to the basic type HKE range), the second one is EO (add a 4~20mA feedback signal module to the basic type HKE range), the third one is EIO (add a 4~20mA valve position control signal module and a 4~20mA feedback signal module to the basic type HKE range).

This enhanced type HKE range actuator is 1200 starts per hour as its operation frequency at specified modulating load torque.

Enhanced HKE range



5.3 Control and Wiring

Please refer to: Section 4.3, Chapter two.

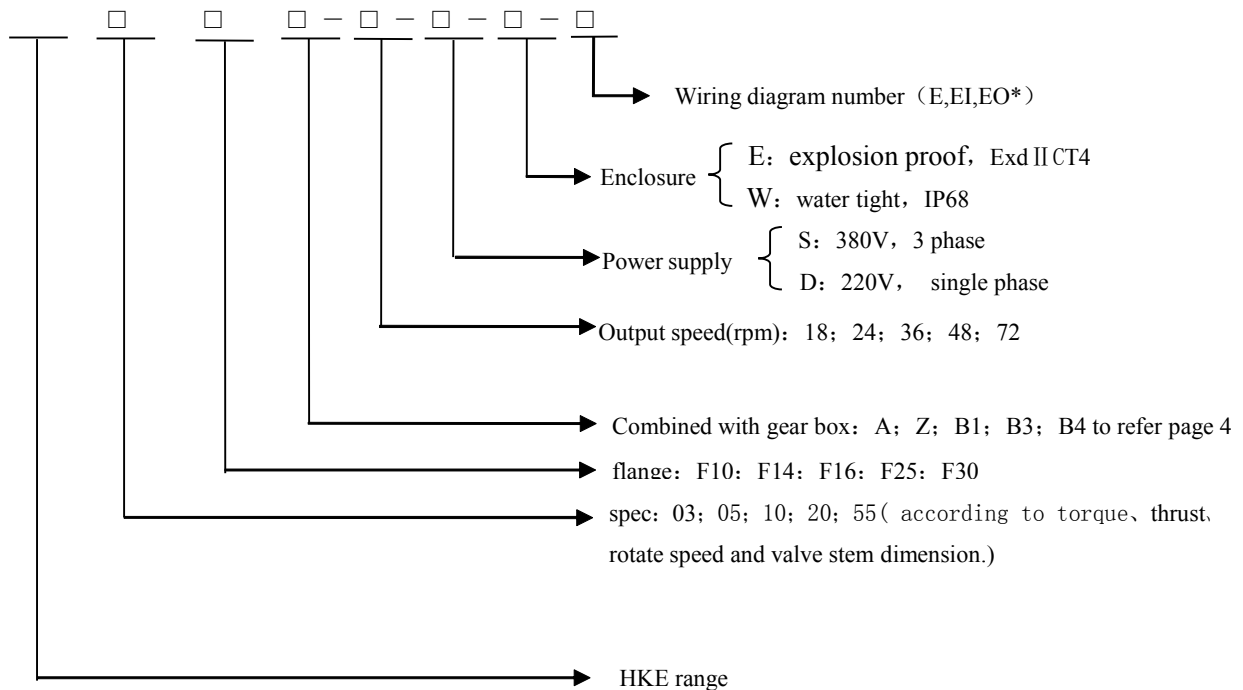
6. Control mode

Please refer to: Section 5, Chapter two.

7. Order

Please fully fill in following “product number suffix designations” while you order the actuators to us, the last suffix number of ordering information means the actuator model, and if you require order a gear box, you need to label its model number.

7.1 Product number suffix designations

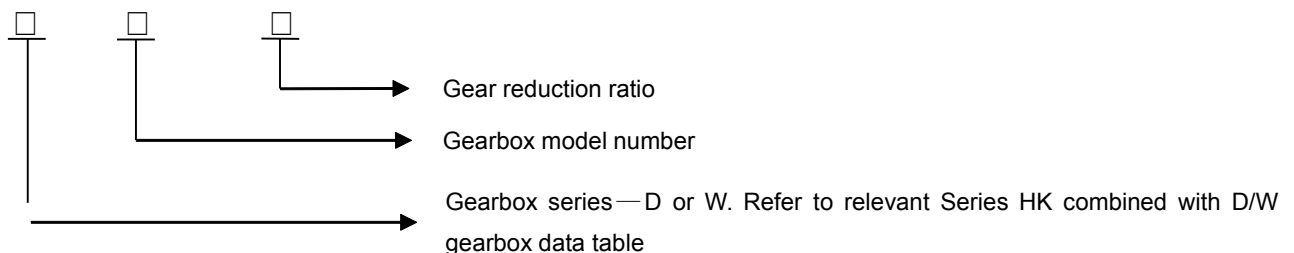


For instance: HKE10-F14A-24-S-W-EIO

Output modulating torque=109Nm, coupling flange=F14, drive coupling="A", output speed=24rpm, power supply= AC 380V, enclosure=IP68 water tight, wiring type=EIO.

*** Please refer to 5.1, 5.2**

7.2 Gearbox



Detailed information about the gearbox selection refer to the corresponding gearbox selection instructions.

For instance: W5-40 :1

Gearbox series=W series, model number= 5, gearbox reduction ratio= 40:1.

The actuator nameplate does not label the gearbox model number even if the actuator and the gearbox are assembled together and delivered, the gearbox have own nameplate and the gearbox model is labeled on it.

8. Machining of the Drive Bush

Please refer to: Section 7, Chapter two

9. Installation of the Actuator

Please refer to: Section 8, Chapter two

10. Operating your Actuator

Please refer to: Section 9, Chapter two

11. Debugging your Actuator

Please refer to: Section 10, Chapter two

12. Alarm Message Display

Please refer to: Section 11, Chapter two

13. Lubrication and Maintenance

To ensure the actuator's smooth running, the HK actuators must use the lubricating agents in the following table. Improper lubrication may adversely affect the dependability of the actuator. The temperature range of the environment is $-22^{\circ}\text{F}/-30^{\circ}\text{C} \sim -160^{\circ}\text{F}/+70^{\circ}\text{C}$. In the extreme climates, there are special requirements:

Movement Viscosity at 100°C , flash point of 150°C at minimum, and solidifying point at not more than -45°C .

Lubrication table:

Manufacture Unit	Lubrication trademark
Beijing Changcheng Lubrication CO.,LTD	Burthen vehicle gear wheel oil 75W/90
USA	Mobil SAE80EP

If your actuator has run for six months, change the lubrication once a year.

Lubrication Capacity:

Actuator Spec	Capacity
HKE03	0.3L
HKE05	0.3L
HKE10	0.8L
HKE20	0.8L
HKE55	1.1L

Machine Maintenance:

If your actuator has run for six months, you must tighten the installation bolts.

Every actuator has been fully tested before leaving the factory to provide years of trouble free operation.

If your actuator can not be installed immediately, store it in a dry place until you are ready to connect incoming cables. Don't pull out the transit cable entry plugs until you are ready to connect incoming cables. At the same time you must pull out the battery until you are ready to install the actuator.

14. Changing Battery

Please refer to: Section 13, Chapter two

15. Important Notices

Please refer to: Section 14, Chapter two

Chapter five HKJ/HKJM range intelligent electrical actuator selection, installation and debugging instructions

“Hurko” HKJ/HKJM range intelligent electrical angle travel actuator, a very important field control equipment, has been widely used in electricity station、metallurgy、petroleum、chemistry industry、water conservancy、machine、light industry、fire protection、environment protection department and so on. The actuator, combined with a valve that can be one of the ball valve、butterfly valve、Air-throttle valve and so on, is appropriate to the fields of pipeline flow control、pollutants dumping、water treatment、paper making、ship building etc. Even in badly dangerous environment it can work reliability for its terse design. “Hurko” HKJ/HKJM range actuator provides for you the most reasonable scheme in the range of 60Nm~2500Nm.

1. Structure of HKJ series intelligent electrical angle travel actuator
 - (1) **Motor:** Entire seal mouse cage type asynchronous machine. It has big force at start moment and small inertia, and can be appropriate to all kinds of valve system. The motor equips a hot protector, and can be one phase power supply motor or three phases power supply motor.
 - (2) **Observation window:** It's transparent, and through it you can observe the continual position instruction provided by the instructor.
 - (3) **Position indicator:** The bell display directly assembly on the main axle, used for the dynamic instruction valve the positional information.
 - (4) **Intelligent control unit:** The control unit uses the brand-new integrated SOC chip, has the man-machine dialogue function, and highly intellectualized degree.
 - (5) **Wire connection plug:** The wiring way used in the HKJ series actuator has met the plug-in unit. Wires from outsider are all connected to the plug. So there is no necessary to disconnect a wire but tear off the plug, when to dismantle the actuator or maintenance. The plug is waterproofing and explosion-proof. This design avoids reconnecting the wires and preventing the wiring error.
 - (6) **Torque protector:** to provide the over-load protection.
Travel switch: provided only in common type actuator (not provided in intelligence actuator)
 - (7) **Thrust force unit:** The thrust force unit including the foundation and the actuation wrap. Setup of foundation conforms to the ISO5211 standard. The actuation wrap can be easily connected to all kinds of valve shafts.
 - (8) **Worm reduction gear:** Precise worm gear and worm bearing adjuster reduction gear, has small clearance, high efficient, long life, low noise (max: 50dB), and self-lock function that can avoid reverse rotation when power off or signal lost suddenly.
 - (9) **Switch handle:** this equipment permit switch between electrical operation and manual electrical operation mutually.
 - (10) **Manual operation:** After press the switch handle to manual operation position, the actuator can be operated by the handwheel. The switch handle will be automatically switched to electrical operation model when motor works.
 - (11) **Handwheel:** the size design of the handwheel guarantees security and laborsaving.

2. Production characteristics

Liquid crystal display

The liquid crystal display, using digitals, real time displays the valve position and the alarm information according to the work condition and instructs the close and open limit position by high brightness LED

Control model

The actuator can be controlled by remote on-off signals (or optional remote 4~20mA current signal) and local operation knob.

Status feedback

Actuator instructs to the customer the close and open limit position and malfunction alarm information by relays output (and valve position by optional 4~20mA current signal).

Debugging without uncovered

By the operation knobs, work parameters can be set and limit position can be debugged, during which the cover is no need to be opened, so the dust and humidity are prevented and security and reliability of electrical control unit are improved.

High intelligence

With the control unit using the brand-new integrated SOC chip, the actuator has the man-machine dialogue function, and highly intellectualized degree.

Closure characteristics

Because aluminum cover and box after their face bonderized have the very strong anticorrosion ability, the stationary fit places have the “o” circles, and the coordination places have the skeleton oil seal, the box body has reached the closure level:IP68. The optional explosion-proof box body can be appropriate to level IIA and IIB dangerous work environment example: No.1 area, No.2 area and all so, where filled with level T1~T4 explosible air.

High efficient and low noise

Precise worm gear and worm bearing adjuster reduction gear, has small clearance, high efficient, long life, low noise (max: 50dB).

Self-lock

Self-lock function can avoid reverse rotation when power off or signal lost suddenly.

Coupling automatic reset

The coupling permit switch between electrical operation and manual electrical operation mutually. When the switch handle pressed to manual operation position, the actuator can be operated by the handwheel. The switch handle will be automatically switched to electrical operation model when motor works.

Handwheel

The size design of the handwheel guarantees security and laborsaving.

Motor

Entire seal mouse cage type asynchronous machine has big force at start moment and small inertia, and can be appropriate to all kinds of valve system. The motor inside equips a hot protector.

Wiring convenience

The wiring way used in the HKJ series actuator has met the plug-in unit. Wires from outsider are all connected to the plug. The plug is waterproofing and explosion-proof. This design avoids reconnecting the wires and preventing the wiring error.

Absolutely encoded position transducer

Our company's intelligence electrical actuator can optionally fit absolutely encoded position transducer to replace the position potentiometer. The absolutely encoded position transducer adopting non-touched detecting technology has extremely high precise and long life.

Main control board

Adopt four layers wiring technology, devices produced by world famous manufactory, and high quality automatic face mount craft to ensure the control core high reliability and long life. Using brand-new SOC chip as core, the electrical init is high intelligent and has man-machine dialogue function.

Remote input and relay interface board

This interface board receives on-off signals from customer and outputs the relay status to customer. All input and output are isolated from main control board through photoelectricity in this interface board, to ensure the main control board high anti-disturb.

Structurized electrical unit

The main control board and remote interface board can be extremely conveniently assembled together and disassembled. Their message passed through the connecting plug-in unit.

LCD and knob induction board

LCD, using digitals, real time displays the valve position and the alarm information according to the work condition. The knob equipping magnetic steel triggers the reed pipe through the electromagnetic induction, and its install axle does not through the box body to ensure the high closure level: IP68.

3. Type specification table

Table-1:

HKJ range on-off model actuator specification table (single phase power supply)								
Part number	Max torque	Rated torque	Travel time 60/50Hz	Max valve axle diameter	Motor power	Rated current 110V/220V	Handwheel circle number	weight
	Nm	Nm	S	mm	W	A	n	kg
HKJ06	60	50	14/17	22	15	1.00/0.53	8.5	11
HKJ09	90	75	14/17	22	25	1.30/0.6	8.5	11
HKJ15	150	125	17/20	22	40	1.60/0.80	10	12
HKJ19	190	160	17/20	22	45	1.70/1.10	10	13
HKJ28	280	235	20/25	22	50	2.00/1.20	12.5	17
HKJ38	380	320	20/25	32	60	2.80/1.40	12.5	18
HKJ50	500	420	20/25	32	90	3.60/1.70	12.5	19
HKJ60	600	500	24/29	42	90	3.60/1.70	14.5	22
HKJ80	800	670	24/29	42	140	4.00/2.00	14.5	23
HKJ100	1000	840	24/29	42	180	4.80/2.40	14.5	25
HKJ150	1500	1250	72/87	75	90	3.60/1.70	43.5	68
HKJ200	2000	1670	72/87	75	140	4.00/2.00	43.5	7
HKJ250	2500	2100	72/87	75	180	4.80/2.40	43.5	70

Note: motor current at start moment is as twice as rated current

Table-2

HKJM range modulating model actuator specification table (single phase power supply)								
Part number	Max torque	Modulating torque	Travel time	Max valve axle diameter	Motor power	Rated current 110V/220V	Handwheel circle number	weight
	Nm	Nm	S	mm	W	A	n	kg
HKJM06	50	25	14/17	22	15	1.00/0.45	8.5	11
HKJM09	80	40	14/17	22	25	1.30/0.58	8.5	11
HKJM15	130	70	17/20	22	40	1.60/0.95	10	12
HKJM19	160	85	17/20	22	45	1.70/0.95	10	13
HKJM28	260	130	20/25	22	50	2.00/0.95	12.5	17
HKJM38	350	175	20/25	32	60	2.80/1.30	12.5	18
HKJM50	420	230	20/25	32	90	3.60/1.50	12.5	19
HKJM60	520	270	24/29	42	90	3.60/1.50	14.5	22
HKJM80	700	360	24/29	42	140	4.00/2.15	14.5	23
HKJM100	880	450	24/29	42	180	4.80/2.45	14.5	25
HKJM150	1350	720	72/87	75	90	3.60/1.50	43.5	68
HKJM200	1800	950	72/87	75	140	4.00/2.15	43.5	7
HKJM250	2300	1100	72/87	75	180	4.80/2.45	43.5	70

Note: motor current at start moment is as twice as rated current, and max torque is 1.2 times to rated torque

Table-3

HKJ series actuator specification table (three phases power supply)

Part number	Max torque	Rated torque	Modulating torque	Travel time	Max valve axle diameter	Motor power	Rated current 380V/440V	Handwheel circle number	weight
	Nm	Nm	Nm	S	mm	W	A	n	kg
HJ/HJM06	60	50	30	14/17	22	15	0.25/0.14	8.5	11
HJ/HJM09	90	75	45	14/17	22	25	0.28/0.20	8.5	11
HJ/HJM15	150	125	75	17/20	22	40	0.39/0.33	10	12
HJ/HJM19	190	160	95	17/20	22	45	0.50/0.36	10	13
HJ/HJM28	280	235	140	20/25	22	50	0.40/0.34	12.5	17
HJ/HJM38	380	320	190	20/25	32	60	0.45/0.35	12.5	18
HJ/HJM50	500	420	250	20/25	32	90	0.73/0.60	12.5	19
HJ/HJM60	600	500	300	24/29	42	90	0.73/0.60	14.5	22
HJ/HJM80	800	670	400	24/29	42	140	0.80/0.72	14.5	23
HJ/HJM100	1000	840	500	24/29	42	180	0.98/0.80	14.5	25
HJ/HJM150	1500	1250	750	72/87	75	90	0.73/0.60	43.5	68
HJ/HJM200	2000	1670	1000	72/87	75	140	0.80/0.72	43.5	7
HJ/HJM250	2500	2100	1250	72/87	75	180	0.98/0.80	43.5	70

Note: motor current at start moment is as twice as rated current; Character "H" instead of "HK", this means HJ/HJM06 is HKJ/HKJM06 in fact, the others are the same too.

4. Technology specification and performance

Closure level: IP68

Power supply: 110/220VAC (-15%~+10%), 50/60Hz (-2%~+2%)
380/440VAC (-10%~+10%), 50/60Hz (-2%~+2%)

Travel: 0~110°

Travel time: refer to table-1~table-3

Output torque: refer to table-1~table-3

Work environment temperature: -10~+70°C or optional -30~+70°C

Limit position relay: Relay contact is 250VAC/5A. Basic configure contain one close limit relay and one open limit relay.

Torque relay: Relay contact is 250VAC/5A. Basic configure has no torque protection relay.

Main part materials

Box body:	Compression casting aluminum alloy
Cover:	Compression casting aluminum alloy
Worm gear:	Nickel bronze or aluminum bronze
Worm staff:	Alloy steel
Main axle:	Alloy steel
Driving wrap:	Steel or aluminum bronze
Foundation:	Modular cast iron or malleable cast iron

Surface treatment: bonderizing

Outside coating: consist of two layers, the one is metal gray paint 1M-W224 and the other is metal engine baking varnish AC-A1122

Lubrication: senior lubricant

Install: install foundation conforms to the ISO5211 standard..

Wiring holes: are a $M36 \times 1.5$ and a $M22 \times 1.5$ spiral holes or a NPT11/4" and a NPT3/4" spiral holes. Of explosion proof type are two $M20 \times 1.5$ spiral holes
(the hole types must be specified when ordering)

Work frequency:

HKJ on-off model actuator is a intermittent work device, designed for the situation where action frequency

less than 60 times per hour. HKJM modulating model actuator is a continuous work device, inside which the motor's driving model is non-contact SSR (solid status relay), and it can works under modulating torque with frequency not more than 1200 times per hour (single phase power supply actuator is exclusive).

5. Optional item

Explosion proof: box and cover are all explosion proof, and their explosion proof level is exdIIBT4 and their closure level is IP68. They can be used in level IIA and IIB environment example: NO.1 and NO.2 area etc. filled with level T1~T4 explosive mixture.

Travel angle: 120° , 135° , 180° , 270° , 300°

Valve position delivering unit: the unit linearly feedback continuous 4~20mA current to customer according to valve position.

Proportional control unit: this unit receives the 4~20mA current input, and drives the valve to the expected position according to the input current.

Status feedback relay contact:

1. the number of the close limit relay contact and open limit relay contact each can be: ① 1 couple; ② 2 couple; ③ 3 couple.
2. 1 couple of close over-torque relay contacts and 1 couple of open over-torque relay contacts.
3. 1 couple of monitor relay contacts (monitors status of power off, short phase, model knob not in remote position, and proportional control signal lost).

Note: When the close and open torque relay contacts are selected, the max number for each close limit and open limit relay contacts is 2. The type of the contacts (normal open or normal close) can be specially changed by customer in ordering book.

Absolutely encoded position transducer: non-touched detect absolutely encoded position transducer compared with conductive plastics potentiometer has the advantages: no wears, high precise, long life. Refer to the figure-1

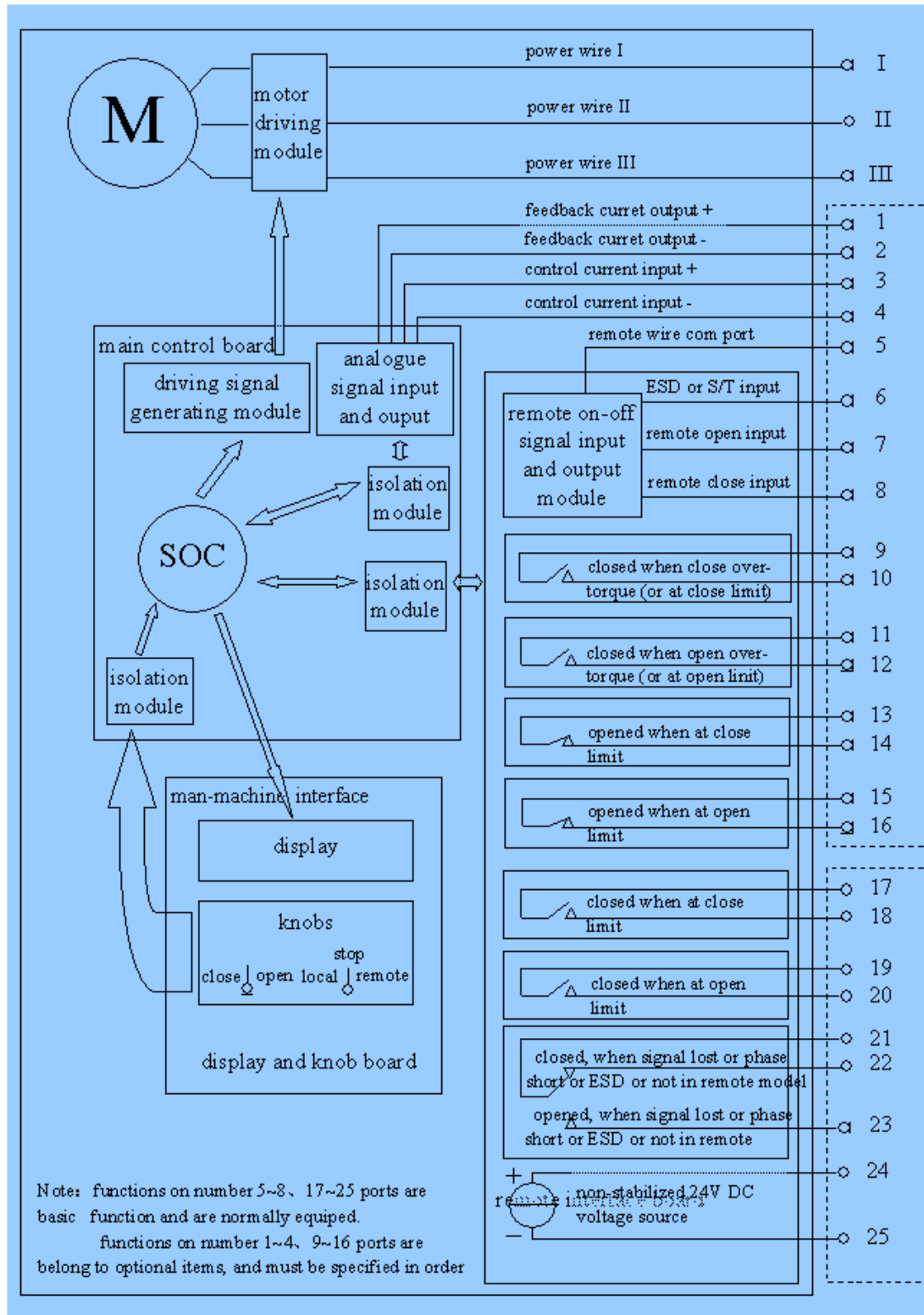
Common type HKJ actuator: this type is a economical one, in which there is no intelligence control unit. A additional outside control box is needed to control it. Its closure and explosion proof level is the same as intelligence one.

Auxiliary limit position switch: provides dry contact signal at the corresponding valve position (triggered by cam). Refer to figure-2.

Auxiliary torque protection switch: provides dry contact signal to control unit when over-loaded (triggered by cam). Refer to figure-3.

Position instruction unit: the electrical part can select conductive plastics potentiometer or absolutely encoded position transducer. The machine part has anti-gear-clearance function, and can precisely transfer valve position information in time. Refer to figure-4.

6. HKJ intelligence actuator wiring diagram



7. Field bus control system

A communication card installed inside can provide remote control and status feedback through a couple of twisted pair line. The communication distance reaches 20km without any repeater using RS485 as physical and data link layers protocol. Communication protocol can be one of the below:

Modbus

Hurko actuator inside can install a single channel or double channel communication card, and through it can provide full control functions and status datum. Even system variable for example: device address and baud

rate also can be set remotely by modbus.

Profibus

Actuator with profibus card inside can be connected to profibus network, and through the profibus network can receive all control commands from remote master station and perform them, and also transfer all feedback status datum.

Foundation

Actuator that has match foundation card can connect to foundation network. The foundation module is as programable as other digital or analog module. Actuator with foundation card can communicate each other without any master system.

8. Dimension

Table-2

Type	HKJ06 HKJ09	HKJ15 HKJ19	HKJ28 HKJ38 HKJ50	HKJ60 HKJ80 HKJ100	HKJ150 HKJ200 HKJ250
D (MAX)	22	22	32	42	75
E	55	57	75	85	120
F	43	43	52	59	109
G	2	2	2	2	7
H	355	385	408	448	448
I	56	77	83	99	99
J	175	184	202	226	226
K	60	60	70	78	78
L	213	213	250	283	283
M	273	273	320	361	361
N	102	120	145	175	236
O	68	85	99	116	116
P	113	139	159	191	191
Q	235	265	288	328	328
R	108	108	130	178	178
S	102	102	125	170	170
T					538
U					176
X					450
Y					16
Z					375

9. Valve with actuator configuration table

Pipeline pressure: 1Mpa (10kg/cm²)

Part number	Butterfly valve	Two-way valve	T-valve
HKJ06	80	40	40
HKJ09	100	50	50
HKJ15	125	65	65
HKJ19	150	80	80

HKJ28	200	100	100
HKJ38	250		
HKJ50		125	125
HKJ60	300	150	150
HKJ80	350		
HKJ100		200	
HKJ150	400/450		
HKJ200	500	250	200
HKJ250	600	300	250

Unit: mm

10. Calculating method matching air throttle valve

(1) Circulation air throttle

$$T = \frac{d^3 \times \Delta p}{12 \times n} \times 10^{-8} \times 1.8 \quad (\text{Nm})$$

Loaded bearing=1.8

Unloaded bearing=2.5

(2) Fan type air throttle

$$T = \frac{a^2 \times b \times \Delta p}{8 \times n} \times 10^{-8} \times 1.8$$

a=width

b=length

d=diameter

 Δp =pressure (9.8Pa)

n=fan blade number

11. Services promise to customer

Hurko company follows closely on the industrial automation and information technology innovation, pays attention to user highly the requires as well as benefits, and unceasing finds problems and solves problems to conform leading position throughout in the aspects of satisfying customer, maintain production competitive power, Prompt delivery, and quick post-sale service.

All management according to quality document, all operation according to operation standard procedure, all statement expressed by quality datum, and all work one time to complete are the quality criterion of Hurko company. Every product throughout producing process from investing to delivering is checked strictly, and this ensures product reliability.

Though all have been changing greatly in latest years, our target of pursuing quality and service unchanged.

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